Historic, archived document

Do not assume content reflects current scientific knowledge, policies, or practices.

84Mr
o.2

U.S. DEPT. OF AGRICULTURE
LIBRARY
MAY 5 - 1961
CURRENT SERIAL RECORDS

Analysis of Selected Varieties and Grades of RICE Moving in World Trade

In Terms of U.S. Official Rice Standards

Marketing Research Report No. 460
Foreign Agricultural Service
U.S. Department of Agriculture
March 1961

PREFACE

This publication represents the first section of a two-part report on a Foreign Agricultural Service project conducted over the 1957-60 period. Under the project, samples were taken of the major varieties and grades of rice moving in international trade in both exporting and importing countries. In addition, several principal varieties of rice grown domestically within rice importing countries were collected where a marked consumer preference was indicated. The project was financed in part with funds accruing from Title I sales of agricultural commodities under Public Law 480, and in part with appropriated dollar funds.

This first section of the report covers the evaluation and comparison of the samples as to the types of rice and quality factors under U. S. Official Rice Standards. Part II will deal with physical and chemical characteristics of the same samples as compared with the principal rice varieties now grown in the United States.

The project has been possible only because of the combined efforts of hundreds of individuals in both the United States and the major rice areas of the world. Among them were the U. S. agricultural attachés and their staffs at the foreign posts in which the project was carried out. These attachés were James H. Boulware, Australia; Carl O. Winberg, Burma; Elmer W. Hallowell, Thailand; Donald L. MacDonald, Pakistan; Clarence R. Eskildsen and James P. Hartman, India; Harry A. Varney, Indonesia; John D. Motz, Japan; Quentin R. Bates, the Philippines; Frank W. Ehman, Egypt; Clayton E. Whipple and Paul J. Findlen, Italy; Herbert K. Ferguson, Portugal; John S. Burgess, Jr., Spain; Paul G. Minneman and Henry A. Baehr, France; Edward J. Bell, Greece; William R. Hatch, Iran; Howard A. Akers, Turkey; Phil S. Eckert and Paul F. Taggart, West Germany; Robert A. Nichols, Argentina; Charles M. Elkinton, Paul J. Ferree, and Winfield C. King, Brazil; John E. Montel, Ecuador; Henry Hopp, Colombia; Sam H. Work, Chile; Douglas M. Crawford, El Salvador and Guatemala; William G. Lodwick and Ana M. Gomez, Mexico; George H. Day and Francis H. Jack III, Peru. In Korea, officials of the International Cooperation Administration were especially helpful also.

The development of the project was immeasurably furthered by the strong support of the Rice Research and Advisory Committee of the Department of Agriculture, the Rice Millers Association, and the U. S. Rice Export Development Association. Similarly, a great deal of credit is to be given to the following heads of rice research centers and their staffs: M. J. Copley, Western Utilization Laboratory of the Agricultural Research Service; C. H. Fisher of the Southern Utilization Research Laboratory, and Lee Crane of the Texas Rice and Pasture Improvement Station.

In the selection of tentative lists of desirable varieties to be sampled in various countries, C. Roy Adair of the Agricultural Research Service was extremely helpful. In the field of packaging and distribution, Aaron Altschul of the Southern Utilization Laboratory provided invaluable suggestions and data, as did Louis A. Preli of the Bakelite Company, who in addition contributed considerable packaging material for trial and evaluation.

The final technical work on the quality factor analysis under the U. S. Official Rice Standards of each sample taken was most efficiently carried out under the direction of Walter McCrea, of the Agricultural Marketing Service, and his staff of inspectors.

CONTENTS

Page

I. The Project 1
  Area of operations 1
  Sampling methods 1
  Packaging and shipment 2
  Analysis under U.S. Official Rice Standards 3

II. General Conclusions 4
  Comparison by quality factors:
    Long grain 6
    Medium grain 6
    Short grain 6
    Parboiled rice 6
  Classification in terms of U.S. varieties 7
  Classification according to U.S. classes and grades 9

III. Analysis of samples, by country 11
  Oceania and Asia:
    Australia 11
    Burma 11
    Communist China 15
    Korea 15
    Thailand 16
    West Pakistan 18
    East Pakistan 19
    India 20
    Indonesia 24
    Japan 26
    Philippines 28
    Egypt 29
  Europe:
    Italy 29
    Portugal 30
    Spain 31
    France 31
    Greece 32
    West Germany 32
    Iran 33
    Turkey 34
  South America:
    Argentina 34
    Brazil 35
    Ecuador 36
    Colombia 37
    El Salvador 38
    Guatemala 38
    Mexico 38
    Peru 39
    Chile 39
    Venezuela and Costa Rica 40

ANALYSES OF SELECTED VARIETIES AND GRADES OF RICE MOVING IN WORLD TRADE, IN TERMS OF U.S. OFFICIAL RICE STANDARDS

By Dexter V. Rivenburgh, Grain and Feed Division

I. THE PROJECT

The Foreign Agricultural Service in 1957 began a project which represents a first step toward defining the kinds of rice that move in international trade and the kinds preferred by consumers in importing countries. Its goal is to help establish some basis for comparing the competitive position of a particular rice in a particular market. Lack of international grades in rice as well as any semblance of a worldwide international market have always made this comparison difficult.

Using the U.S. Rice Standards as a measuring stick, the samples collected under the project in the rice producing and consuming countries of the world were analyzed in a two-part study. The first, reported on here, has to do with the types and quality of the rice; the second, which will be published later, concerns itself with the physical and chemical characteristics of the samples.

For this study the grading analysis on all samples was performed by the rice grading service of the Agricultural Marketing Service at New Orleans, La. The laboratory testing for chemical and physical factors was divided according to their specialized research interests between the Texas Rice and Pasture Improvement Station in Beaumont, Tex., the Southern Utilization Laboratory (ARS) at New Orleans, and the Western Utilization Laboratory (ARS) at Albany, Calif. Cooking quality evaluations were made on a selected group of samples by Agricultural Research Service in Beltsville, Md.

AREA OF OPERATIONS

In its 2 years of field operations (1958-59), the project covered 31 countries; 14 were exporters and 17 importers. Obviously the sampling did not in any way adequately cover any individual country, but it was made in countries that accounted for 84 percent of the world's production for those 2 years. The 14 exporting countries sampled represented 69 percent of total world exports and the 17 importing countries, about 43 percent of world imports.

SAMPLING METHODS

In the areas where a large number of samples were taken in the aggregate, contracts were entered into with either international or local firms competent to draw representative samples. For some areas where the number of samples desired was small and/or where adequate facilities did not exist for contracting, samples were taken by U.S. agricultural attachés or their assistants, International Cooperation Administration personnel, and in some scattered instances by Washington personnel of the Foreign Agricultural Service. Techniques for these noncontract samplings were the same as for the others.

Samples were taken from stocks of rice in storage for export, from shipments enroute, from shipments in storage at ports of destination, and from local stocks of indigenously produced rice, including samples from retail market outlets. The general requirement was that samples be so taken that the rice could be identified as far as possible as to (1) point of origin, (2) local or trade name of the variety, (3) grade, if any known system of quality rating existed, (4) year it was grown, (5) what special processing it had had, i.e., parboiled, glazed, etc., (6) whether grown as upland or irrigated rice, and (7) whether the variety was a major one in the export or the domestic market.

Representative samples of about 3 pounds were drawn under standard procedures for sampling. These samples were divided into two or four representative parts. One part was packed and dispatched by air to the Grain Testing Laboratory at New Orleans, La. It is with this part that the present report is concerned. (Testing of the other one to three parts will be discussed in the second section of the report, which will be published later.)

PACKAGING AND SHIPMENT

Samples were firmly packed in polyethylene bags and sealed with plastic tape. Several thicknesses of the polyethylene material were used, such as 5 mil. DYNH-3 film and 1.5 mil DFDA-0111 film. Some material in the form of what is commonly available as plastic ''freezer bags'' was also used. The 5-mil. and the 1.5-mil. gage bags worked splendidly, but the commercial type of ''freezer bag'' was sometimes punctured, particularly by extremely long and thin type rice. This difficulty was overcome by using a double-bag approach. The individual polyethylene bags, firmly packed, were placed in a heavy canvas bag and tied securely. The packing of sample material in the polyethylene containers in a manner to minimize air pockets proved highly important, for transmission via air freight at relatively high altitudes caused bags to burst if there was an appreciable air pocket in the inner bag.

The samples were shipped by air partly to cut transportation time, but more importantly to reduce the average temperatures to which they were subjected between sampling time and arrival at U.S. destination points for analysis and testing, where they were placed under controlled conditions. In the initial stage of the development of the project, it was feared that it might be difficult to maintain relatively constant levels of moisture or of insect infestation in view of the elapsed time between sampling and analysis. The project was successful in the case of moisture, as it became quite apparent that the moisture level had remained constant. Similarly, insect infestation, while not as well controlled as moisture content, had not progressed to a point which would preclude a good approximation of original quality. A ticket was placed into each sample portion, identifying the lot sampled and giving other pertinent information obtained at the time of sampling.

In the initial stages of the project a preliminary study had been made of a variety of packaging materials which might afford maximum protection to the rice and at the same time insure the arrival in the United States in about the same condition as when the sample was taken. The questions of moisture content, reaction to high temperatures and high humidity, and the physical behavior of the package at high altitudes in unpressurized freight compartments were considered to be of extreme importance. There was a lack of definite information as to exactly what would happen under such conditions. The range of materials investigated included cloth bags, kraft paper, laminated paper, paper laminated with foil, moisture-proof cellophane, metal cans, fiber cartons, and polyethylene bags. Many of these had one or more disadvantages, such as possibility of insect infestation, entrance of moisture, pick-up of objectionable odors, expense consideration in terms of weight.

A number of field tests were made with packages which seemed to have certain advantages. Packages of rice were dispatched from Washington to distant points in the Far East and then shipped back. The roundtrip subjected both the rice and the container to the same variations in temperature, humidity, and high altitude pressures that a one-way trip of an actual sample would encounter, and, in effect, placed the packaging material under a double strain. The results of these tests indicated that a sealed polyethylene bag packed in a protective outer canvas bag would meet the problems expected.

ANALYSIS UNDER U. S. OFFICIAL RICE STANDARDS

Upon arrival at the laboratories of the AMS grading service in New Orleans, the samples were subjected to the same procedures as are used for U.S. rice received from a commercial source with a request for a grading certificate.

The quality factors on which the individual grading certificates were issued included the following:

(1) Percent of moisture,

(2) The total number of seeds on the basis of a 500-gram sample and the total number of heat-damaged kernels,

(3) The percentage of both red rice and damaged kernels on the basis of a 35-gram sample,

(4) The total percentage of red rice and damaged kernels,

(5) The percentage of broken kernels including pieces of kernels of rice less than three-quarters the length of the whole kernel and split kernels of rice passing through a metal sieve 0.032 inch in thickness perforated with round holes $5\frac{1}{2}/64$ of an inch in diameter,

(6) The percentage of broken kernels, etc., under the same conditions as under (5) except that the sieve's perforations were 6/64 of an inch in diameter,

(7) The percentage of broken kernels, etc., under the same conditions as (5) and (6) except that the sieve's perforations were $6\frac{1}{2}/64$ of an inch in diameter,

(8) The percentage of total broken kernels that were three-quarters the length of whole kernels and split kernels,

(9) The percentage of chalky kernels including kernels and pieces of kernels of which one-half or more of each piece was chalky, on the basis of at least a 35-gram sample,

(10) The percentage of contrasting classes where the size, length, or shape of the kernel differed distinctly from the predominate class of the sample, on the basis of the entire sample itself or a portion thereof, but in no case on less than 25 grams cut from the original sample,

(11) Odors, including musty, sour, or those commercially objectionable, reported on the basis of the sample as a whole,

(12) Percentages of foreign material other than milled rice or seeds and including rice hulls and all other material if the percentage was above 0.1 percent, determination being made on the basis of a representative portion of not less than 100 grams cut from the original sample,

(13) The presence of insects including live, dead, insect webbing, debris, and refuse, based on the same as a whole,
The presence of any one category or combination thereof placed the grade as U.S. Sample Grade,

(14) Color for milled rice reported as white, creamy, slightly gray, light gray, dark dray, slightly rosy, and very rosy, the evaluation being based on not less than 250 grams cut from the original sample, and the color of parboiled samples reported as parboiled light, parboiled and/or parboiled dark,

(15) The degree of milling, reported as reasonably well milled or well milled, based on at least 250 grams cut from the original sample,

(16) Ungelatinized kernels in parboiled rice, reported in percentages based on a representative portion of not less than 35 grams cut from the original sample,

(17) Low quality rice which otherwise was of low quality because of contamination, including that by rats, mice, or birds, was reported separately.

The U.S. grade of each sample was reported in terms of:

Class, according to the U.S. classes of rice, i.e., Rexora, Patna, Blue Bonnet, Nira, Fortuna, Blue Rose, Improved Blue Rose, Greater Blue Rose, Kamrose, Arkrose, Magnolia, Zenith, Calrose, Early Prolific, Pearl, Mixed milled rice, Second Heads, Screenings, and Brewer's milled rice.

Numerical grade, U.S. 1, 2, 3, 4, 5, 6, and Sample Grade for milled rice; U.S. 1, 2, 3, 4, 5 and Sample Grade for Second heads milled rice and Screenings milled rice.

Limiting factors, the major limiting factors which resulted in the numerical grade assigned.

II. GENERAL CONCLUSIONS

The factors used in evaluating grades and qualities divide themselves generally into three separate categories: Those that occur or develop in the (1) production stage, (2) processing cycle, and (3) storage or marketing stages of milled rice. The following tabulation shows in what percentages of all samples a single factor could be the limiting one for purposes of grading.

Phase or origin	Factor	Percent
Production	Rice of contrasting classes	19
	Seeds, heat-damaged kernels	5
	Foreign material[1]	4
	Red rice	2
	Damaged kernels[1]	1
	Moisture[1]	6
Milling	Reasonably well	81
	Broken kernels through 6/64 sieve	30
	Total brokens above grade	65
	General appearance	4
Marketing	Weevils occurring as a single factor	25
	Weevils combined with other factors	75
	Low quality	2

---

[1] May also originate in the milling phase.

While any general appraisal of a series of samples taken under widely varying, and in many cases inadequate, grading systems must of necessity be extremely broad in its application, the foregoing table gives an indication as to where the maximum ranges of variations occur.

Outstanding among the limiting factors originating in the production phase is "rice of contrasting classes", with 19 percent of all samples being downgraded because of this one point alone. For each of the samples in the 19 percent, the percentages of other classes were high enough to require classification as "Mixed Milled Rice" under U.S. Standards.

The presence of foreign matter and seeds and heat-damaged kernels ranks second in this group, with 4 to 5 percent of all samples requiring a Sample Grade listing because of these factors.

Among the factors originating in the processing phase, the degree of milling stood rather well, with 19 percent rated well milled (equivalent to a U.S. #1 grade on this particular factor). Practically all other samples were rated "reasonably well milled." It would seem, therefore, that in most respects the milling of rice throughout the world is fairly efficient insofar as the removal of bran layers is concerned. However, the occurrence of small broken kernels is highly significant in lowering the grade of rice in general, some 30 percent of all samples being downgraded by the number of broken kernels passing through a 6/64 sieve. This may be due to antiquated milling equipment, absence of specific grading standards, varieties having a low outturn of head rice, or any combinations of these. Field observations, however, would seem to indicate that the reasons may be expected to apply in the order stated.

The total amount of brokens reported is also a significant factor, with only 35 percent of samples showing brokens at or below the percentage called for by the individual grade. The remaining 65 percent were reported as having percentages higher than the maximum called for.

The conclusion can be drawn that (1) existing national grading systems as a whole do not result in an adequate maintenance of average quality or that (2) the quality of rice generally is lowered by ungraded rice moving into trade. The widespread practice of mixing head rice and brokens under other than controlled conditions makes it impossible to separate these two possibilities. However, as there is a relatively large quantity of rice moving into international trade under specifications covering the percentage of brokens, it is likely that existing grading systems have not yet become successful in adequately maintaining quality levels.

Assuming that milled rice going into storage for export opportunities or being shipped into export channels is reasonably satisfactory on the basis of the factors largely determined in the production and processing cycles, the important factors related to, or originating in, the marketing phase remain--insect infestation, contamination, and foreign odors. The most important by far, in terms of frequency of occurrence, is insect infestation.

There is not as yet any wide agreement on what constitutes insect infestation. Perhaps the most extreme--or the most advanced--position is that of the United States: That the occurrence of injurious insects or evidences of their presence in rice, or even on the bag or in the warehouse facilities in which the rice is sampled, is sufficient evidence of infestation, resulting in the grade being set at a U.S. Sample Grade level. The question of insect infestation control is one which may take some time to solve, and any solution may depend on further technological advances in chemistry and insecticides. The world rice trade is almost always associated with long sea transport--Asian rice moving to the Middle East, Europe and Africa and Western Hemisphere rice moving to Asia. In terms of temperature, humidity, and time, such transport is conducive to the development of weevils. This project substantiated the fact that practically all rice of an Asian origin imported into West Germany, Belgium-Luxembourg, the Netherlands, Switzerland, and the United Kingdom is subject to reprocessing of one sort or another. This does not mean that the intrinsic quality factors are altogether lacking but rather that the insect population is favored by a long sea voyage.

COMPARISON BY QUALITY FACTORS

The samples of the three classes of rice--long, medium, and short grain--demonstrated rather important differences in the degree to which the several quality factors became grade-limiting factors. The comparative distributions of the importance of the grade-limiting factors of each of the three classes and for all samples is shown in table 1.

TABLE 1.--Comparative importance of quality-limiting factors, by selected types of rice

Factor	All samples	Long grain	Medium grain	Short grain
	Percent	Percent	Percent	Percent
Rice of contrasting classes	19	38	15	2
Seeds, heat-damaged kernels	5	5	3	10
Foreign material	4	0	1	6
Red rice	2	2	2	0
Broken kernels through 6/64 sieve	30	35	48	16
Brokens above grade specifications	65	58	50	83
General appearance	4	1	4	10
Moisture	6	0	2	18
Low quality	2	1	3	2
Odor	([1])	0	0	0

[1] Practically absent in raw milled rice but generally observed in parboiled rice.

Long Grain

Samples representing the long grain class, when compared to all samples, might be rated as the highest quality on the basis of the total number of factors in which the percentage was superior to all samples. However, on the question of individual factors, the picture is somewhat different. For rice of contrasting classes, the long grain group had a percentage nearly double that for all samples, and a high percentage where the number of broken kernels passing through a 6/64 sieve was a limiting factor.

Medium Grain

The medium grains ranked the highest of the three classes, exceeding all samples only for broken kernels passing through a 6/64 sieve and for low quality.

Short Grain

This group ranked the lowest of the three groups when judged on seeds, heat-damaged kernels, presence of foreign material, percentage of brokens above grade specifications, general appearance, and moisture. However, it was by far the best as regards the percentage of samples having rice of contrasting classes and grains of red rice.

Parboiled Rice

In view of the fact that parboiled rice represents an appreciable portion of world trade, samples were taken in appropriate areas. It must be noted, however, that the principles underlying the parboiling process vary materially throughout the world. The United States uses the better grades of paddy and a highly technical, scientifically controlled process; its resultant product is designed to enhance nutritional and storage qualities. Elsewhere, parboiling has many gradations from the U.S. industry's processes. Some of the techniques are primitive, having changed little from those employed hundreds of years ago.

The results of the survey tend to indicate that those countries which use parboiling for their domestic production but are basically net importers of rice produce a better product according to U.S. standards than the countries which produce parboiled rice for export. Generally speaking, rice from the exporting countries where it was sampled in any volume had an objectionable (commercially) odor. Perhaps one of the reasons for this is that the parboiling practice is often employed to utilize poor quality paddy to obtain maximum volume for export. Quite common also is the fact that much of the production is apparently of mixed classes of rice. This gives further support to the idea that parboiling may be conducted more on the basis of effective utilizations of poor quality paddy than to produce a specialty product, as is the case in the United States.

A comparison of the frequencies of individual grade-limiting factors for the parboiled rice samples and all samples is presented in table 2, together with the origins of such grading factors.

TABLE 2.--Comparative importance of quality-limiting factors in all samples and in parboiled rice, by category

Category and factor	All samples	Parboiled
	Percent	Percent
Paddy:		
Rice of a single type	81	79
Rice of contrasting classes	19	21
Seeds, heat-damaged kernels	5	0
Foreign material	4	8
Red rice	2	3
Odor	16	66
Moisture	6	3
Damaged kernels	1	3
Milling:		
Degree of milling:		
Well milled	19	30
Reasonably well milled	81	70
Broken kernels through a 6/64 sieve	30	20
Total brokens at or below grade	35	30
Total brokens above grade	65	70
General appearance	4	0
Marketing:		
Weevils as a single factor	25	8
Weevils combined with other factors	78	80
Low quality	2	0

CLASSIFICATION IN TERMS OF U. S. VARIETIES

One of the important objectives of this study has been to identify the varietal names and other trade designations under which rice from other countries is merchandized, and to compare or relate this nomenclature to U.S. varieties and grades. The identification of the foreign varietal names, under which the samples were obtained, with U.S. varieties is presented in the following tabulation.

Identification of foreign varietal names in terms of U.S. varieties

U.S. variety	Area and local variety	
Rexora	India	Basmati
	Pakistan	Do.
Blue Bonnet	India	Itawa
		Kalina
		Pamal
	Mexico	Blue Bonnet
	Thailand	Local varieties
	Indonesia	Benewan
Century Patna	India	Charmarmanti
		Sitasal
		Bhrimri
	Burma	Zeera
	Brazil	Local variety
		Agulha
	Pakistan	Parmal
Patna	do	Do.
		Basmati
	Iran	Saori
		Dom Siah Rashti
	Surinam	Local variety
Edith	Burma	Zeera
		Yahine
		Ekarine
		Sughandi
	Thailand	Local varieties
	Mexico	Jujotla
		Morado Crioila
		Colima
	Brazil	Sequeiro
		Agulha
		Sigadis
		Remadja
	Greece	Bersani
Early Prolific	Brazil	Local varieties
Prelude	do	Do.
Toro	India	Sashibalam
		Hansa
	Thailand	Local varieties
	Pakistan	Kangi
		Begami
		Joshi
		Balam
Fortuna	India	Itawa
	Thailand	Local varieties
	Mexico	Jujotla
Blue Rose	India	Germutic
		Kauk Kyee
	Argentina	Blue Rose
	Brazil	Local variety
	Portugal	Giganti 1
	Chile	Local variety
	Italy	Arborio
Nato	India	Chhachi
		Akulu
		Hansa
Nato--Continued	Burma	Bingala
	Philippines	Wag Wag
		Nayrosa
	Pakistan	Inora Sail
	Mainland China	Variety unknown
	Italy	Do.
	Egypt	Do.
	Colombia	Roja
		#203
	Ecuador	Rojo
	Peru	Local variety
Zenith	India	Germutia
		Benisar
	Thailand	Local varieties
	Argentina	Chacarero
	Brazil	Local varieties
	Philippines	Wag Wag
		Elon-Elon
		Ramilad
		Menantica
	Pakistan	Kajla
Calrose	Burma	Meedone
		Laroong
		Ngasein
	Mainland China	Jojuko
	Chile	Lonquen
	Colombia	Leecerna
	Ecuador	Lucerne
	Peru	Local variety
Pearl	India	Gundan Samba
		Kasmio
	Burma	Kalagyi
		Nacrinzie
		Salanet
	Argentina	Local variety
	Brazil	Chumbinho
		Calora
	Korea	Jo Wang
		Pal Tal
		Pung-OK
		Um Bang Jo
		Sunshu
		Jo De Kwan
		Chote Kewan
		Yuji #132
		Non-Gnim
	Australia	Calorall
	Japan	Norin Nos.1,22, 41,29,18
		Koshiji-Wase
		Sasashigure
		Kinmaze
		Kinnmapu
	Egypt	Local variety
	Italy	Do.
	Spain	Bellock

Identification of foreign varietal names in terms of U.S. varieties--Continued

U.S. variety	Area and local variety	
Pearl--Continued	Taiwan	Bon Lai
	Portugal	Gigantio 2 Mercantile Corriente
	Greece	Omincano 1600
	Iran	Guerdah
	Italy	Avorio Originario

CLASSIFICATION ACCORDING TO U. S. CLASSES AND GRADES

The names and grades under which many foreign countries export rice are in themselves intelligible only to people who are intimately acquainted with the rice trade in the particular foreign exporting or importing countries. In the following tabulation the foreign names and grades of the samples collected have been related to the U.S. classes and grades as determined by the AMS Rice Inspection Service. (A further discussion of the factors which determined the assigned grades is to be found in section III of this report.)

Principal kinds of foreign rice, with the U.S. class and grade for the sample collected

Origin	Foreign variety	Exporter's grade	U.S. class	U.S. grade
Australia	Calora 11	Export 10% brokens	Pearl	U.S.#2
		Domestic 20% brokens	....do	U.S.#4
		Brokens #1	Second heads	U.S.#1
		Brokens #2	Screenings	U.S.#3
Burma	Ngasein	Japan - 15%	Calrose	U.S.#5
		Japan - 25%	....do	Sample
		Europe #2 - 25%	....do	Do.
		Europe #3 - 30%	....do	Do.
		SMQ - 38%	....do	Do.
		SMS - 42%	....do	Do.
	Meedone	Japan - 15%	....do	U.S.#5
		Japan - 25%	....do	Do.
		BQ - 38%	....do	Sample
	Laroong	Japan - 25%	....do	U.S.#5
		SMS - 42%	....do	Sample
	Ekare	....do	....do	Do.
	Sughandi	Japan - 15%	Edith	Do.
		SMS - 35%	....do	Do.
	Bingala	....do	Nato	Do.
	Ekarine	....do	Edith	Do.
	Nacrinzie	Japan - 15%	Pearl	Do.
	Salanet	BQ - 38%	....do	Do.
	Yahine	SMS - 42%	Edith	Do.
	Kalagyi	BQ - 38%	Pearl	Do.
	Zeera	SMS - 35%	Edith/Century Patna	Do.
	Kaukkyee	BQ - 38%	Blue Rose	Do.
	O'Byan	SMS - 42%	Shoemeo	Do.

Principal kinds of foreign rice, with the U.S. class and grade for the sample collected--Continued

Origin	Foreign variety	Exporter's grade	U.S. class	U.S. grade
Burma.......	Parboiled:			
Continued	Ngasein..........	Milchar #1 - 8%.......	Mixed parboiled.......	Sample
		Milchar #2 - 10%......	Calrose parboiled.....	Do.
		12%..................	....do................	Do.
	Long boiled......	10%..................	Mixed parboiled.......	Do.
	Emata............	10%..................	....do................	Do.
	Brokens:			
	1-2-3 mixture....	....	Screenings............	Do.
	2-3-4 mixture....	....	Brewers rice..........	U.S.#3 to Sample
Thailand....	100% white rice..	1st quality...........	Blue Bonnet...........	U.S.#3
		2nd quality...........	....do................	U.S.#4
	White rice.......	5%....................	Mixed.................	U.S.#5
		10%...................	....do................	Do.
		15%...................	....do................	Do.
		20%...................	....do................	U.S.#6
		Super - 25%...........	....do................	Do.
		25%...................	....do................	Sample
	Parboiled:			
	White rice.......	100%..................	Mixed parboiled.......	Sample
	Parboiled........	5%....................	....do................	Do.
		10%...................	....do................	Do.
		25%...................	....do................	Do.
	Glutinous........	10%.		
	Brokens:			
	Large............	A-1 Super.............	Screenings............	U.S.#4
		A-1 Special...........	Brewers...............	Do.
	Medium...........	A-1 Ordinary..........	....do................	Do.
	Small............	C-1 Ordinary..........	....do................	Sample
	Glutinous........	A-1 Special...........	Screenings............	U.S.#4
Japan.......	All local varieties...........	Grade #1..............	Pearl.................	U.S.#2,3
Italy.......	Americano 1600...	Mercantile............	....do................	U.S.#5
		Raffinato I°..........	....do................	U.S.#3
		Raffinato II..........	....do................	Do.
	Rena 100 Bersani.	Raffinato I°..........	Honduras..............	U.S.#2
		Raffinato II°.........	....do................	U.S.#3
		Mercantile............	....do................	U.S.#4
	Arborio..........	Raffinato II°.........	Blue Rose.............	U.S.#3
		Mercantile............	....do................	U.S.#5
Portugal....	Gigante 1°.......	....	....do................	U.S.#4
	Gigante 2°.......	....	Pearl.................	U.S.#5
	Carolina.........	....	Honduras..............	U.S.#3
	Mercantile.......	....	Pearl.................	Sample
	Corriente........	....	....do................	Do.
Spain.......	Belloch..........	0-15%.................	....do................	U.S.#3
		1-15%.................	....do................	U.S.#4
		Japan - #1............	....do................	U.S.#3
France......	Ballila..........	Table rice............	....do................	Do.
	Stirpe 82........	Deluxe table..........	Fortuna...............	Do.
	Rinaldo Bensani..	....do................	Edith.................	Do.
Mexico......	Jujutla..........	Super extra...........	Fortuna...............	Do.
	Blue Bonnet......	25%...................	Blue Bonnet...........	U.S.#5
		50%...................	....do................	Sample

III. ANALYSIS OF SAMPLES, BY COUNTRY

In the following pages is a summary of the analysis of the factors that limited the quality of the sample taken in the project. The highlights for each series of samples for specific varieties or grades, which follow the introductory statement for the country, represent averages of the total number of samples taken. The parenthetical phrase after the variety name or other identification is the grade or designation (if any) given by the foreign exporter or producer.

OCEANIA AND ASIA

Australia

Although many rice varieties have been tried in Australia, current production is confined to Calora 11, developed from improved strains of Calora which were obtained from the United States in 1922. The seed project has been administered by the New South Wales Rice Marketing Board in conjunction with the New South Wales Department of Agriculture. In view of the fact that Australian export availabilities of rice consist only of Calora 11 and because it is the usual practice to list specifications in each contract of sale, Australia has not found it necessary to adopt a specific system of rice grades for the international market. Generally the system adopted or practiced by Australian millers is as follows:

Grade 1, for export containing up to 10 percent brokens, with the broken kernels no smaller than half kernels.

Grade 2, whole rice for the Australian domestic market containing up to 20 percent broken grains (no smaller than half kernels).

Grade 3, mill specials containing 20 percent whole grains and 80 percent half grains.

Grade 4, No. 1 brokens - all half grains.

Grade 5, No. 2 brokens - all kernels smaller than one-half kernels.

Grade 6, No. 3 brokens - dust and pinhead rice.

Analyses of the samples taken in the project reported on here were as follows:

1. Calora 11 (export grade, 10 percent brokens). Samples were well milled, white color. Average grade, U.S. #2 Pearl. Average broken content, 6.2 percent.

2. Calora 11 (domestic grade, 20 percent brokens). Samples were well milled, white color. Average grade, U.S. # 4, Pearl. Average broken content, 20.9 percent.

3. Brokens (No. 1 grade). Samples were well milled, white color. Average grade, U.S. # 1 Second Heads.

4. Brokens (No. 2 grade). Samples were well milled, white color. Average grade, U.S. # 3 Screenings.

Burma

Burma has long been the largest exporter of rice in the world and has a well defined series of varieties or types of rice designed for the export market. These are Ngasein, comparable to U.S. Calrose, marketed in 11 different grades of milled rice ranging from 100 percent head rice to 45 percent brokens; Meedone, comparable to U.S. Calrose variety, marketed in 5 grades ranging from 15 percent total broken content to 38 percent;

Laroong, comparable to U.S. Calrose, with grades ranging from 25 to 42 percent brokens; Sughandi, comparable to the U.S. variety Edith, with grades ranging from whole rice to 35 percent brokens. Other types are Ekare resembling Calrose, Bingala resembling Nato, Ekarine resembling Edith, Nacrinzie resembling Pearl, Salanet resembling Pearl, Yahino resembling Pearl, Kalagyi resembling Pearl, Zeera resembling Century Patna and Edith, Kaukkyee resembling Blue Rose, and D'byan resembling Shoemed.

Not only are these types well defined, but according to samples taken there are few instances of mixed varieties. Also, the Burmese Government has a well organized system of grading based on adherence to type, degree of milling, and amount of large brokens, small brokens, and foreign material. The system has been successful although it does not give the same weight to insect infestation and small brokens as the U.S. system.

On the basis of volume, the exports in order of importance are (1) medium grain (comparable to Calrose); this includes Ngasein, Meedone, Ekare, and Laroong. (2) Long grain, with Sughandi, Ekarine (resembling Edith), and Zeera (resembling Century Patna). (3) Short grain, which includes Yahine, Salanet, and Nacrinzie. The project data show clearly that the maximum export of Burma is represented by a Calrose type.

Milled Rice

1. Ngasein (Japan 15 percent brokens grade). Samples series taken in 1958 showed some variations from those of 1959 in total damaged kernels, percentages of total broken kernels (from 16.2 to 22 percent), contrasting classes (1.3 to 2.4 percent), occurrence of insects, milling (which varied from reasonably well to well milled), and color (gray to light gray). When these factors were on the low side and no insect infestation was present, the grade was U.S. #4 Calrose. With insects present and with the higher range of other limiting factors the grade assigned was U.S. Sample grade Calrose.

2. Ngasein (Japan 25 percent brokens grade). Samples for both seasons showed seeds, red rice, and damaged kernels as limiting factors. Insect infestation was noted in about one-half the total sample. The single consistent factor was the percentage of brokens passing through a 6/64 sieve. All samples graded U.S. Sample grade Calrose because of this common factor. Total brokens, 26.2 to 30 percent.

3. Ngasein (Europe #2 - 25 percent brokens grade). Samples of this grade for the 2 years showed marked ranges on seeds, brokens passing through a 6/64 sieve, and percentage of total brokens. While the sample represented well milled characteristics, the color varied between white and slightly gray. Insect infestation was common to all lots inspected. All samples graded U.S. Sample grade Calrose. The average broken content, 26.5 to 40 percent.

4. Ngasein (Europe #3 - 30 percent brokens grade). All samples varied considerably on seeds, damaged kernels, red rice, total brokens, and contrasting classes. The samples were about equally divided as to being well milled or reasonably well milled and as to insect infestation. Color of the grain ranged from white to light gray. The percentage of brokens passing through a 6/64 sieve was a common limiting factor in both 1959 and 1958. Where insects were present the average grade was U.S. Sample grade Calrose. Where evidence of infestation was lacking the samples graded U.S. # 5 Calrose on the average. Total broken content, 30.1 to 54 percent.

5. Ngasein (SMQ - 35 percent grade). All samples were high in seed content, heat-damaged kernels, total damaged kernels, brokens passing through a 6/64 sieve. Traces of foreign material were generally present. Insect infestation and brokens passing through a 6/64 sieve were common to all lots inspected. All samples graded U.S. Sample grade Calrose. Total broken content, 37-38 percent.

6. Ngasein (SMS - 42 percent brokens grade). Limiting factors were seeds, brokens passing through a 6/64 sieve, and insects. Samples generally graded U.S. Sample grade Calrose. Total broken content, 37-38 percent.

7. Meedone (Japan, 15 percent brokens grade). Samples showed seeds and total damaged kernels as limiting factors. Insect infestation was present in 50 percent of all samples. With insect infestation present, average grade was U.S. Sample grade Calrose. Total broken content, 18.8 to 21.0 percent.

8. Meedone (Japan, 25 percent broken grade). General limiting factor was insect infestation. Where this was evident, average grade was U.S. Sample grade Calrose. Where absent, the grade was U.S. #4 Calrose. Total broken content, 20.1 to 24 percent.

9. Meedone (B.Q. - 38 percent broken grade). Samples consistently graded U.S. Sample grade Calrose with the limiting factor the percentage of brokens passing through a 6/64 sieve.

10. Laroong (Japan, 25 percent broken grade). All samples were high in seeds, heat-damaged kernels, red rice, damaged kernels with traces of foreign material. Samples graded U.S. #5 to #6 Calrose. Total broken content, 20.4 to 25.6 percent.

11. Laroong (SMS - 42 percent brokens grade). Samples were generally high in seeds, heat-damaged kernels, red rice, brokens passing through a 6/64 sieve. Average grade U.S. Sample grade Calrose. Total broken content, 38.2 to 44 percent.

12. Ekare (SMS - 42 percent brokens grade). Samples showed seeds, damaged kernels, brokens passing through a 6/64 sieve, and insects as limiting factors. Average grade was U.S. Sample grade Calrose. Average broken content, 36.2 percent.

13. Sughandi (Japan, 15 percent brokens grade). There was considerable variation between samples taken out of this class in 1958 and 1959. The quality factors in which such variations were most apparent were seeds, heat-damaged kernels, red rice, total damaged kernels, and contrasting classes. Insects were generally present but did not affect the final grade. Average grades ran between U.S. Sample grade Mixed milled rice and U.S. Sample grade Edith. Total broken content, 20.7 to 24 percent.

14. Sughandi (SMS - 35 percent brokens grade). Samples were high in seeds, heat-damaged kernels, and brokens passing through a 6/64 sieve. Insects and traces of foreign material were uniformly present, but levels of other limiting factors would have caused no change in grade if insect infestation had been lacking.

15. Bingala (SMS - 35 percent broken grade). Samples were high in seeds, red rice, and brokens passing through a 6/64 sieve, with traces of foreign matter and insects uniformly present.

16. Ekarine (SMS - 35 percent broken grade). Samples uniformly showed seeds, heat-damaged kernels, brokens passing through a 6/64 sieve, traces of foreign material, and from traces of to actual insect infestation. Regardless of the degree of insect infestation the average of the samples graded showed a rating of U.S. Sample Edith, with 25.1 to 34.3 percent brokens.

17. Nacrinzie (Japan, 15 percent brokens grade). Samples were very high in heat-damaged kernels, high in red rice and damaged kernels, and insects were present. Combination of other factors would have prevented any increase in the quality rating if insect infestation had not occurred. Average grade, U.S. Sample Pearl. Average broken content, 14.8 percent.

18. Nacrinzie (B.Q. - 38 percent broken grade). Samples were high in seeds, heat-damaged kernels, and red rice; they were gray in color, with insects and traces of foreign material. Insects were not the sole limiting factor. Average grade, U.S. Sample grade Pearl. Average broken content, 20.2 to 22.7 percent.

19. Salanet (SMS - 15 percent broken grade). Insects and seeds were limiting factors. Average grade, U.S. Sample grade Pearl. Average broken content, 15.8 percent.

20. Yahine (SMS - 42 percent brokens grade). Samples showed high level of seed count, heat-damaged kernels, and brokens passing through a 6/64 sieve. Average grade, U.S. Sample grade Edith. Average broken content, 32 - 46.6 percent.

21. Kalagyi (B.Q. - 38 percent broken grade). Samples had high seed count, heat-damaged kernels, and total damaged kernels; trace of foreign matter was present. Average grade, U.S. Sample grade Pearl. Average broken content, 27.1 percent.

22. Zeera (SMS - 35 percent broken grade). Samples showed substantial variation in seed count, heat-damaged rice, damaged kernels, and kernels passing through a 6/64 sieve. Also they varied in class of rice. Samples over the 2 years were about equally divided as U.S. Sample grade Edith or Century Patna. Insect infestation was lacking. Range of broken content, 23 to 43 percent.

23. Kaukkyee (B.Q. - 38 percent broken grade). The limiting factor was kernels passing through a 6/64 sieve. Average grade, U.S. Sample grade Blue Rose. Average broken content, 18 percent.

24. D'byan (SMS - 42 percent broken grade). Limiting factors were seeds, heat-damaged kernels, total damaged kernels, and kernels passing through a 6/64 sieve; only traces of foreign material and insects were found. Average grade, U.S. Sample grade Shoemed. Total broken content averaged 35.2 percent.

Parboiled Rice

1. Ngasein (Milchar #1, 8 percent broken grade). Samples represented reasonably well to well milled rice, with a high percentage of contrasting classes. Moisture was within limits but high. Limiting factor in all cases was an objectionable odor. Average grade, U.S. Sample Mixed milled rice parboiled. Broken content, 20.1 to 24 percent.

2. Ngasein (Milchar # 2, 10 percent broken grade). Samples indicated a high seed content, total damaged kernels, and contrasting classes. Limiting factor was the presence of an objectionable odor. Average grade, U.S. Sample grade Calrose Parboiled. Average broken content, 20.1 to 24 percent.

3. Ngasein (12 percent broken grade). Samples showed considerable number of seeds and high percentage of red rice and damaged kernels. Limiting factor for all samples was an objectionable odor. Average grade, U.S. Sample Calrose Parboiled. Average broken content, 16.4 to 20 percent.

4. Long Boiled (10 percent broken grade). A series of well milled samples was taken in 1959. Limiting factors were the percentage of contrasting classes, objectionable odors, and insect infestation. Traces of foreign matter were generally present. The average grade was U.S. Sample Mixed milled rice parboiled. The average broken content was 16.9 percent.

5. Emata (10 percent broken grade). This series of samples was taken in 1958. The limiting factors were found to be the percentage of contrasting classes, insect infestation, and a marked objectionable odor. The average grade was U.S. Sample Mixed milled rice parboiled. Average broken content, 20 percent.

Broken Rice

1. Brokens (1-2 mixture grade). Limiting factor for these samples was insects. Average grade, U.S. Sample Screenings.

2. Brokens (2-3-4 mixture grade). Samples showed foreign material in some instances and general appearance in others as limiting factor. The average grade fell between U.S. Sample Brewers and U.S. #3 Brewers.

Communist China

1. Medium grain variety (grade unknown). High seed and heat-damaged kernel content and percentage of brokens passing through a 6/64 sieve were limiting factors. U.S. Sample grade Nato. Average broken content, 34 percent.

2. Medium grain variety (grade unknown). High seed count and percentage of brokens passing through a 6/64 sieve were limiting factors. Average grade U.S. Sample grade Magnolia. Average broken content, 40.9 percent.

3. Medium grain (35 percent brokens grade). Limiting factors were brokens passing through a 6/64 sieve and contrasting classes. Average grade, U.S. Sample grade Mixed milled rice (Nato and Magnolia). Average broken content, 32 percent.

4. Medium grain (grade unknown). Samples were high in seeds and red rice, and some had insects and foreign material. Average grade, U.S. Sample grade Calrose. Average broken content, 23.6 percent.

5. Jojyuko (grade unknown). Average grade, U.S. #4 Calrose.

Korea

As Korea has not official rice grades, domestic rice in consumer markets is apt to be a mixed grade (although perhaps mixed in the sense of various varieties of Pearl). The samples taken under the project represent average quality of rice offered in major consumer retail markets. The area covered included eight separate provinces of Korea and provided an excellent cross section of domestic rice supplies and consumer preferences.

There are three rather distinct patterns of rice varieties in Korea: (1) The old varieties dating back before the Japanese occupation, (2) the varieties largely prevalent and developed during the long period of Japanese control, and (3) the new improved varieties that are currently under study by Korean technicians. The series of samples drawn under the project were those included under (2). The samples taken are indicative of the fact that the Koreans prefer short grain rice similar to U.S. Pearl, well milled, and with a relatively low percent of brokens.

Milled Rice

(1) Jo Kwang (grade unknown). Samples had over 15 percent moisture and were well milled. Average grade, U.S. Sample grade Pearl solely on moisture factor. Average broken content, 8 percent.

(2) Pal Tal (grade unknown). Samples were well milled, average grade, U.S. #3 Pearl. Average broken content, 12 percent.

(3) Pung-OK (grade unknown). Samples were reasonably well milled. Average grade, U.S. #3 Pearl. Average broken content 6.3 percent.

(4) Um Bang Jo (grade unknown). Samples were reasonably well milled and general appearance was fair. Average grade, U.S. #3 Pearl. Average broken content, 11.7 percent.

(5) Sunsuh (grade unknown). Samples were high in brokens passing through 6/64 sieve and had some chalky kernels. General appearance was fair. Average grade, U.S. #3 Pearl. Average broken content, 4.4 percent.

(6) Cheon Bon-Uk (grade unknown). General appearance was fair. Average grade, U.S. #3 Pearl. Average broken content, 3.7 percent.

(7) Jo De Kwan (also known as Chote Kewan; grade unknown). General appearance was fair. Average grade, U.S. #4 Pearl. Average broken content, 5.5 percent.

(8) Yuku-132 (grade unknown). Limiting factor was kernels passing through 6/64 sieve. Average grade, U.S. #3 Pearl. Average broken content, 8.3 percent.

(9) Nongnim (grade unknown). Limiting factor was brokens passing through a 6/64 sieve. Average grade, U.S. #5 Pearl. Average broken content, 10.8 percent.

Thailand

Thailand is the second largest exporter of rice in the world, exceeded only by Burma. Predominately, Thai production is of the long grain rice, but exports are almost entirely of a mixed milled rice. The principal U.S. varieties resembling this mixed production are Blue Bonnet, Edith, Fortuna, Zenith, Toro, Nato, and Magnolia.

The Thai Government has in the past few years developed an inspection system and set of standards of relatively high quality. The grading system was too new in the years 1958 and 1959, when the samples under this project were drawn, to judge its results. Eventually, however, the Thais will perfect the inspection system and should be successful in establishing an adequate system of grades. The greatest factor which has to be overcome is the question of the production of straight line classes rather than having final grades on exportable supplies fall in the Mixed Milled Rice category. The second problem of Thailand is to eliminate losses in quality because of insect infestation both in storage and in transit.

(1) 100 Percent White Rice (1st quality grade). Samples were well milled, with kernels of a white color, but were fairly high in seeds and contrasting classes. Insects were present. Samples during 1958 and 1959 were fairly consistent, but with lower seed counts and percentages of broken kernels occurring in 1958. Average grade, U.S. Sample Blue Bonnet. The grades assigned would have been U.S. #3 without insect infestation. Average broken content, 3.4 percent.

(2) 100 Percent White Rice (2nd quality grade). Samples taken in 1959 were well milled, of a white color, with some seeds and insects generally present. Average grade, U.S. Sample grade Blue Bonnet. Average broken content, 0.8 percent. Without insect infestation the average grade would have been U.S. #4. Samples taken in 1958 were in general reasonably well milled and slightly gray in color. The seed count was lower than in 1959 samples but the total percent of damaged kernels was high. Contrasting classes was the principal limiting factor. Insects were absent. Average grade, U.S. #4 Blue Bonnet. Average broken content, 2.5 percent.

(3) White Rice (5 percent brokens). The samples taken throughout 1958 and 1959 were consistent in the percentage of contrasting classes and the presence of insects. The average grade was U.S. Sample Mixed milled rice (Edith, Blue Bonnet, Zenith, Nato, and Fortuna classes). The total broken content averaged 4.6 percent in 1959 and 3.8 in 1958. Without the presence of insects the average grade would have been U.S. #5.

(4) White Rice (10 percent brokens). Samples for 1959 and 1958 were fairly consistent in seed count, size of brokens, total red rice and damaged kernels, presence of insects and traces of foreign material. In 1959 the percentage of brokens was 13 compared to 11.2 percent in 1958. Contrasting classes were 39 percent in 1959 against 29.4 percent in

1958. The average grade for both years was U.S. Sample grade Mixed milled rice (Edith, Blue Bonnet, Nato, Toro and Zenith). Without insect infestation the grades assigned would have been U.S. #5.

(5) White Rice (15 percent brokens). The 1959 series of samples indicated this as a mixture, with 16.7 percent total brokens, brokens of a fair size, slightly gray in color, with insects present. The average grade was U.S. Sample grade Mixed milled rice (Zenith, Edith and Gitterbug). Without insect infestation the grade assigned would have been U.S. #5.

The 1958 sample series averaged a lower percentage of contrasting classes, higher in red rice and damaged kernels, and lower in seeds and heat damaged kernels. The color was a light gray. Total brokens were 16.4 percent. The average grade was U.S. Sample grade Magnolia. Without insect infestation the average grade assigned would have been U.S. #4.

(6) White Rice (20 percent brokens). This grade was sampled only in 1958. It was exceptionally high in seed count, high in red rice and damaged kernels, high in brokens passing through a 6/64 sieve and in contrasting classes. Insects were present. The average grade was U.S. Sample Mixed milled rice (Edith and Magnolia). The percentage of total broken kernels was 22.6 percent. Without insect infestation the average assigned grade would have been U.S. #6.

(7) White Rice (Super 25 percent broken grade). Samples taken in both 1959 and 1958 showed as serious limiting factors seeds, heat-damaged kernels, red rice, small-sized brokens, contrasting classes, and insect infestation. On the factors of seeds, red rice, damaged kernels, and size of brokens the 1959 series was numerically better, although the color of the 1958 samples was gray compared to a light gray for 1959. In addition the classes of rice were different. The average grade assigned for both years was U.S. Sample Grade Mixed milled rice. In 1959 the classes were Edith and Zenith, while in 1958 they were generally identified as Toro and Magnolia. The percentage of total brokens was consistent at 44.5 to 45 average for the 2 years. Without insect infestation the grade assigned would have been U.S. # 6.

(8) White Rice (25 percent broken grade). This grade was only sampled in 1958. Heat-damaged kernels and contrasting class percentages as well as insect infestation were limiting factors. The average grade was U.S. Sample grade Mixed milled rice (Edith and Magnolia). The average percentage of brokens was 45.2.

Parboiled Rice

(1) Parboiled (100 percent). Samples were taken in both 1958 and 1959. In 1959 they were grade U.S. Sample grade, parboiled Blue Bonnet with an average of 1.5 total broken kernels. The principal limiting factor was the presence of insects. In the 1958 series, contrasting classes and objectionable commercial odor were generally present. The average grade assigned was U.S. Sample grade Mixed rice, parboiled (Blue Bonnet and Zenith). The average percentage of brokens was 3.6.

(2) Parboiled (5 percent broken grade). Samples for both 1958 and 1959 were graded U.S. Sample grade Mixed milled rice, parboiled (Edith, Blue Bonnet, Nato). The principal limiting factors were objectionable odor and insect infestation. The average total broken content ranged from 3.5 to 5.9 percent.

(3) Parboiled (10 percent broken grade). Samples were relatively high in red rice and damaged kernels and had contrasting classes. Insects were a factor in 1959 but generally absent in the 1958 series. The average grade was U.S. Sample grade Mixed milled rice, parboiled (Nato and Edith). The percentage of total broken kernels ranged from 12.3 to 13 percent.

(4) Parboiled (25 percent broken grade). Percentage of red rice and damaged kernels ran fairly high as well as brokens passing through a 6/64 sieve. Contrasting classes and insect infestation were also a limiting factor. Samples taken in 1959 were free from objectionable odor but those in 1958 were so classed. Some foreign matter also was noted in the 1958 series. Average grade for the 2 years of sampling was U.S. Sample Mixed milled rice, parboiled (Blue Bonnet, Edith and Nato).

Glutinous Rice

(1) Glutinous (10 percent broken grade). This was sampled only in 1958. It was generally high in seeds, heat-damaged kernels, and total damaged kernels. Rice was well milled, slightly gray in color, with only a trace of brokens passing through a 6/64 sieve. The average grade was U.S. Sample Early Prolific. The average broken content was 11.1 percent.

Broken Rice

(1) Brokens, large (A-1 Super Grade). Samples taken over the 2 years varied from reasonably well milled to well milled and in color from slightly gray to white. Traces of foreign material were generally present. Insect infestation varied. Samples generally fell into two groupings dependent largely on insect infestation. These ranged from U.S. Sample grade Screenings to U.S. #3 Screenings.

(2) Brokens, large (A-1 Special Grade). Limiting factors were some red rice, chalky kernels, and for some individual lots a high seed count as well as showing insect infestation. Samples generally divided into two classifications: U.S. Sample Brewers rice and U.S. #3 Brewers rice. The determining factor was largely insects.

(3) Brokens, medium (A-1 Ordinary Grade). In these samples the percentage of red rice was high, foreign material was common to most samples, and insects were present in 75 percent of the lots. Predominantly the samples graded U.S. Sample Brewers because of insect infestation and foreign material. Where these were absent (25 percent of the samples) the grade was U.S. #3 Brewers.

(4) Brokens, small (Cl-Ordinary Grade). Red rice, foreign material, and insects were consistently limiting factors. Samples in 1958 and 1959 all grade U.S. Sample Brewers.

(5) Brokens, glutinous, medium (A-1 Special Grade). The samples were well milled, slightly gray with only traces of foreign material. The principal limiting factor was the general appearance of the samples. They graded U.S. #2 Screenings.

West Pakistan

The production of rice in West Pakistan is of secondary importance to other grains; rice is used as a supplement to wheat in the diet. The surplus rice in the fine grain types, for example, Basmati, Parmel, and Sugdashi, is exported, the first two varieties as raw milled rice and Sugdashi as parboiled. In a medium grain type, Begami also is exported. The so-called bold types Kangi and Joshi while exported in small amounts are used principally for domestic consumption and for export to East Pakistan. Before the establishment of Pakistan as an independent government, the trade in rice was on a pattern of exports from West Pakistan to India and the Red Sea area and imports into East Pakistan from India. The partition cut across trade lines in rice, and so practically up to now two countries exist as far as rice is concerned.

Milled Rice

(1) Kangi (Grade #1). Samples were high in total seeds, heat-damaged kernels, red rice, brokens passing through a 6/64 sieve, and insects present. Average grade, U.S. Sample grade, Toro. Average broken content, 38 percent.

(2) Kangi (Grade # 2). Samples were extremely high in total seeds and high in red rice, brokens passing through a 6/64 sieve, and insects present. Average grade, U.S. Sample grade Toro. Average broken content, 59.5 percent.

(3) Permal (Grade #1). Samples were high in red rice and damaged kernels. Average grade, U.S. #5, Patna. Average broken content, 7.5 percent.

(4) Permal (Grade #2). Samples were high in total seeds and insects present. Average grade, U.S. Sample grade, Patna. Average broken content, 8.2 percent.

(5) Basmati (Grade #1). Samples were extremely high in total seeds and heat-damaged kernels. Average grade, U.S. Sample grade, Patna. Average broken content, 7.2 percent.

(6) Basmati (Grade #2). Samples were extremely high in total seeds and heat-damaged kernels; insects were present. Average grade, U.S. Sample grade, Patna. Average broken content, 10 percent.

(7) Begami (Grade #1). Samples were high in total seed, red rice, damaged kernels; insects were present. Average grade, U.S. Sample grade, Toro. Average broken content, 9.4 percent.

(8) Begami (Grade #2). Samples were extremely high in total seeds and percentage of red rice; insects were present. Average grade, U.S. Sample grade, Toro. Average broken content, 17.8 percent.

Parboiled Rice

(1) Joshi (parboiled, Grade #1). Samples were extremely high in total seeds, high in brokens passing a 6/64 sieve; some insects were present, and samples were free from ungelatinized kernels. Average grade, U.S. Sample grade, parboiled Toro. Average broken content, 35 percent.

(2) Joshi (parboiled, Grade #2). Samples were high in damaged kernels and insects present. Average grade, U.S. Sample grade, parboiled, Toro. Average broken content, 19 percent.

(3) Permal (parboiled, Grade #1). (Probably varietal name correctly spelled as Parmal.) Samples were extremely high in total seeds, with rodent excreta generally present. Average grade, U.S. Sample, parboiled Century Patna. Average broken content, 25 percent.

(4) Permal (parboiled, Grade #2). (Probably varietal name correctly spelled as Parmal.) Samples were high in total seeds, brokens through a 6/64 sieve, with insects and rodent excreta present. Average grade, U.S. Sample grade, parboiled, Century Patna. Average broken content, 39 percent.

East Pakistan

East Pakistan is a rice deficit area; before partition it got most of its supplies from the adjacent area in India. Since partition its food has come from West Pakistan and from imports.

Practically all of the domestic production of rice is parboiled. The following local varieties of major importance were sampled.

Parboiled Rice

(1) Kajla (Grade #1, parboiled). Samples were high in percentage of red rice and ungelatinized kernels; insects were present. Grade, U.S. Sample, parboiled Zenith. Total broken content, 19.3 percent.

(2) Kajla (Grade #2, parboiled). Sample was high in percentage of red rice, foreign material, and ungelatinized kernels. Grade, U.S. Sample, parboiled Zenith. Total brokens, 29.0 percent.

(3) Balam (Grade #1, parboiled). Sample was high in brokens passing through a 6/64 sieve and in ungelatinized kernels, insects were present. Grade, U.S. Sample, parboiled Toro. Total brokens, 27 percent.

(4) Balam (Grade #2, parboiled). Sample was high in brokens passing through a 6/64 sieve, foreign material, and ungelatinized kernels. Grade, U.S. Sample Toro. Total brokens, 41.5 percent.

(5) Kalem Kati (Grade #1, parboiled). Samples were high in red rice, ungelatinized kernels, and contrasting classes. Average grade, U.S. Sample, parboiled Mixed rice. Total brokens, 15.9 percent.

(6) Kalem Kati (Grade #2, parboiled). Sample was high in red rice, contrasting classes, ungelatinized kernels, and foreign matter. Grade, U.S. Sample, parboiled Mixed rice. Total brokens, 17.7 percent.

(7) Inora Sail (Grade #1, parboiled). Samples were generally high in percentage of red rice and damaged kernels as well as ungelatinized kernels. Average grade, U.S. Sample, parboiled Mixed rice. Total brokens, 7.5 percent.

(8) Inora Sail (Grade #2, parboiled). Samples were generally high in red rice and damaged kernels as well as ungelatinized kernels. Average grade, U.S. Sample, parboiled Nato. Total brokens, 9.8 percent.

India

Samples taken in India in 1958 and 1959 were selected to cover as far as possible the varieties that were relatively important in terms of consumer preference. The tremendous number of varieties and regional variations in India made it impossible to anywhere nearly cover the entire range. The project therefore is only intended to give some very general idea as to the types of rice preferred in India and the general level of quality of rice displayed in the markets. Because of the marked preference of large segments of the Indian population for parboiled rice, a substantial number of samples were taken of this processed product.

There are no recognized overall standards for rice grading in India. For some time, however, the Indian Government has been proceeding with drawing up specifications for some of the main varieties of rice. The plan, known as Agmark, is largely a voluntary one whereby cooperating millers or handlers can use an appropriate label and obtain a certification for rice packed under official specifications. In the process of taking samples it was not observed that Agmark was operative to any extent as yet, at least within the areas from which samples were drawn.

The nomenclature of Indian rices varies considerably in different States. This results in the same varietal name being used in different areas for rices having distinctly different physical appearance and in other instances completely different names being given to the same variety. Generally rices are distinguished by the physical shape, i.e., fine, medium, or bold, and by the type of processing, such as raw milled, parboiled, machine milled, or hand pounded. Classification varies also by States, some areas using the breadth of the grain, such as Superfine, 2 mm. or less; Fine, 2.2 - 2.75 mm.; and Coarse, above 2.75 mm. Other classifications noted were Superior, Medium, and Inferior or Superior No. 1, Superior No. 2, Inferior No. 1, and Inferior No. 2 and finally numerical designations, such as Grades I, II, III, IV.

As a whole the average quality of rices covered by the sampling, while falling largely in the area of U.S. Sample Grade, is not as poor as a casual inspection of the quality-factor analysis given in summary at the end of this section would indicate. Domestic rice in the markets apparently has a significantly low percentage of moisture, not too high a percentage of contrasting classes, a good record on odors particularly with the parboiled rices, and is quite often reasonably well milled. (No samples were taken of hand-pounded rice.) A large proportion of samples ran true to class, with not too many instances of grade ratings of "Mixed Rice." The major limiting factors were total seeds, broken kernels passing through a 6/64 sieve, presence of foreign material, and insects in a live, dead, and debris form. Some of the parboiled lots examined showed a high content of ungelatinized kernels.

The percentage of total brokens of all samples of raw milled rice averaged 27 percent, while for parboiled the average was 14.7 percent. This bears out the fact that, while the price of rice is a point of major importance, generally the Indian consumer prefers a long type of grain with the minimum of brokens.

In terms of U.S. varieties of major importance in the export market, Indian varieties as far as indicated by the series of samples taken in 1958 appear to be Blue Bonnet, Rexora, Patna, Century Patna, Calrose, Nato, Zenith, Blue Rose, and Pearl in approximately the order named.

Milled Rice

(1) Basmati. This is the preferred variety in New Delhi, generally commanding a premium price. Samples taken showed a rather wide range of classification in the long grain group, and were fairly evenly distributed in the following classes under U.S. standards for milled rice: Edith, Rexora, Patna, and Century Patna. Moisture content was generally below 10 percent. The seed count averaged about 25, with an excess of 45 not uncommon. Red rice averaged 5.9 percent but heat-damaged kernels and the percentage of damaged kernels were relatively low. Broken kernels ranged from 3.5 to 11.8 percent, with the average about 7.9. The milled quality of this rice rated rather high in the total series of Indian samples. Foreign matter and evidence of insects were generally present. The color of the grain was predominantly a light gray, with a limited number of samples grading gray. The samples graded U.S. Sample, with the limiting factors being insects, seeds, foreign material, and odor, in the order stated.

(2) Gagraj (medium). This rice has a relatively high preference in Madras and Bengal. Broken content averaged about 19 percent but the percentage of brokens passing through a 6/64 sieve averaged about 4. The various lots were rated as U.S. Sample grade Nato because of the kernels passing through a 6/64 sieve and the presence of insects, in that order. The rice was uniformly a light gray in color and was reasonably well milled.

(3) Gurmutia (bold). This variety is produced principally in the State of Mudhya Pradesh. The seed count and the amount of heat-damaged kernels were high, with the percentage of broken kernels averaging about 34 percent. Samples taken in the 1958 series were classified as Zenith, while those in 1959 were largely rated as Mixed milled rice. All samples over the 2-year period were rated U.S. Sample grade because of total seeds, presence of foreign matter, and insects.

(4) Andhra. This is a small round grain resembling Gitterbug. Moisture content was found to be exceptionally low, averaging 7.7 percent. Total seeds and heat-damaged kernels were high. Samples generally were rated U.S. Sample grade Gitterbug because of foreign material, brokens passing through a 6/64 sieve, and the presence of insects.

(5) Parmal (fine). This rice is said to be preferred second to Basmati. This series of samples, although having a high broken content (39 percent), did reasonably well on the percentage of broken kernels passing through the various grading sieves. Samples of Basmati ranged between two types of long grain rice. Samples taken in 1958 were rated as Patna, while in 1959 they were classed as Fortuna. All lots were graded U.S. Sample because of insects, seeds, and heat-damaged kernels, in that order.

(6) Rupshal (fine). Samples averaged 35 percent broken kernels, with 10.5 percent passing through a 6/64 sieve. All samples graded U.S. Sample grade Century Patna because of brokens passing through a 6/64 sieve and the presence of insects.

(7) Kalajira. This is a round grain rice resembling Gitterbug, and is said to have considerable consumer preference in Calcutta. Total broken content averaged 30.5 percent, with 14 percent of the brokens passing through a 6/64 sieve. All lots were rated U.S. Sample grade because of this and also the prevalence of insects.

(8) Luchai (medium). The principal area of production is the State of Madhya Pradish. Two local grades were sampled. One, Luchai No. 1, had 22 percent brokens and was extremely high in total seeds and heat-damaged kernels, brokens passing through a 6/64 sieve, presence of foreign matter, and insects. Samples were generally rated U.S. Sample grade Nato. The same rating was given Luchai No. 2 because of the same factors. The total broken content for this grade averaged 31.2 percent.

(9) Begami (medium). This rice is rated below Basmati and Parmal in terms of consumer preference. It is principally produced in the State of Punjab. It was graded as resembling the U.S. variety Edith. Samples averaged 19.5 percent total brokens, with a fairly uniform size of the brokens. The rating for the group was U.S. Sample grade Edith, with insects largely the limiting factor.

(10) Benisar (medium). Samples averaged 27.6 percent total brokens. They were rated U.S. Sample grade Zenith because of the presence of foreign material and the percentage of brokens passing through a 6/64 sieve.

(11) Ganja Kali (fine). Samples were rated U.S. Sample grade Century Patna because of total seeds, foreign material, and insects.

(12) Ramsagar (medium). Samples averaged 15.9 percent of total brokens under a rating of U.S. Sample grade Zenith because of the presence of foreign material.

(13) Kasbi (fine, medium grade). Total brokens were 24.6 percent, and grade was U.S. Sample grade Edith because of brokens passing through a 6/64 sieve and insects.

(14) Patnai (fine, coarse grade). Total brokens were 38.1 percent, and grade was U.S. Sample grade Zenith because of total seeds and red rice.

(15) Madras Kalam (fine, superfine grade). Total brokens were 17.7 percent. Grade, U.S. Sample Mixed milled rice, because of foreign matter and weevils. Contrasting classes 20 percent.

(16) Surte Kalam (fine, superfine grade). U.S. Sample grade Century Patna because of brokens passing through a 6/64 sieve and insects. Total brokens 14.5 percent.

Parboiled Rice

(1) Sitasal (parboiled, superior grade). This variety is produced principally in the States of West Bengal and Orissa. Samples rated fairly high as a parboiled rice although actually averaging a U.S. #6 grade Delitus because of red rice and damaged kernels. Some samples were rated Century Patna.

(2) Bhimri (parboiled, superfine grade). Samples on average were rated as U.S. Sample grade, parboiled Century Patna. Limiting factors were total seeds, percentage of ungelatinized kernels, and weevils. The percentage of brokens averaged 7.2 percent.

(3) Parmal (parboiled, medium grade). Samples taken averaged 25.8 percent total brokens, with extremely high numbers of total seeds. The average rating was U.S. Sample grade, parboiled Blue Bonnet. It is to be noted that samples of raw, milled Parmal rice taken in 1958 and 1959 were classed as either Patna or Fortuna.

(4) Luchai (parboiled, fine grade). Samples averaged U.S. Sample grade, parboiled Nato because of total seeds and insects.

(5) Sirumani (parboiled, no grade known). Samples averaged U.S. Sample grade, parboiled Nato because of foreign matter, brokens passing through 6/64 sieve. Total brokens, 14.8 percent.

(6) Gundan Samba (parboiled, no grade known). Samples were rated as U.S. Sample grade, parboiled Pearl because of total seeds and foreign matter. Total brokens averaged 6 percent.

(7) Edra Bog (parboiled, no grade known). Samples were graded as U.S. Sample, parboiled Mixed rice because of foreign matter and insects. Total brokens averaged 3 percent and contrasting classes, 29 percent.

(8) Kalma (parboiled, no grade known). Samples averaged 15.3 percent brokens and were rated U.S. # 6 parboiled Blue Bonnet, with brokens passing through a 6/64 sieve the principal limiting factor.

(9) Rupshal (parboiled, no grade known). Samples ran about 20.3 percent brokens, with 24.7 percent in contrasting classes. The series was rated U.S. Sample grade, parboiled Mixed rice because of the percentage of red rice and brokens passing through a 6/64 sieve.

(10) Nona (parboiled, no grade known). Total brokens were 15.1 percent and contrasting classes 19.6. Samples averaged U.S. Sample grade, parboiled Mixed rice because or red rice and damaged kernels.

(11) Chamarmanti (parboiled, superfine grade). The average broken kernel content ranged between 12 and 19 percent. Samples generally were U.S. Sample grade, parboiled Century Patna in 1958 and Gitterbug in 1959. The wide range between the physical characteristics of Gitterbug and Century Patna is illustrative of the variations which occur in the nomenclature of rice in India.

(12) Basmati (parboiled, superior grade). A majority of the samples taken evidenced a rancid odor. The percentage of ungelatinized kernels averaged 12.3 percent. The average grade assigned was U.S. Sample grade, parboiled Rexora.

(13) Itawa (parboiled, no grade known). Total brokens ranged from 10 to 13 percent, with a good rating in terms of size of brokens on samples taken in the 1959 series. For that year, samples averaged U.S. Sample grade, parboiled Blue Bonnet because of insect infestation. In the previous year, the limiting factor was red rice and brokens passing through a 6/64 sieve. The varietal classification assigned was Fortuna but the grade was #6.

(14) Hansa (parboiled, no grade designation known). Samples of the variety showed a very high percentage of total seeds present, contrasting classes, and brokens passing a 6/64 sieve. The average grade assigned was U.S. Sample grade, parboiled Mixed rice. Total brokens averaged 17 percent.

(15) Chhachi (parboiled, no grade designation known). Samples ran about 24 percent brokens, with high percentages of red rice and brokens passing through a 6/64 sieve. All samples rated U.S. Sample grade, parboiled Nato because of the foregoing factors. No ungelatinized kernels were present.

(16) Gurmutia (parboiled, no grade designation known). Samples ranged between 10 and 13 percent brokens, but all were grade U.S. Sample grade, parboiled Zenith (or Blue Rose) because of brokens passing through a 6/64 sieve, total seeds, foreign material, and odor in that order.

Indonesia

Samples were drawn from the midcentral and western parts of Java and southern Sumatra. The major varieties are Bengawan, Peta, Gaddis, and Remadja. There are no government grades as such, but some wholesale grades are used as established by regional customs. A series of samples was taken of domestic rices and imported rices as far as they were available and could be reasonably identified. All of these were milled rice; parboiled rice is not used in Indonesia.

Domestic Production

(1) Sigadis (average market quality). Samples were reported as unpolished, but milled rice other than unpolished was present, as were insects. Average broken kernels passing through a 5½/64 sieve, 6.3 percent; 6/64 sieve, 11 percent; 6½/64 sieve, 24 percent. Average grade, U.S. Sample Screenings.

(2) Sigadis (average market quality). Unpolished foreign material was present. Average grade, U.S. Sample grade Edith, with 74.1 percent brokens.

(3) Remadja (average market quality). Samples in one series showed extremely high content of heat-damaged kernels, high number of seeds, and foreign material. Average grade, U.S. Sample grade Screenings. The second series of samples was of much better quality, limited only by the presence of insects and an average broken content of 54.1 percent. The average grade was U.S. Sample grade Edith.

(4) Bengawan (second grade). Samples taken in 1958 and 1959 were reasonably consistent. Limiting factors were seeds and brokens through a 6/64 sieve. Average grade, U.S. sample Blue Bonnet. Average broken content, 64 percent.

(5) Bengawan (third grade). Limiting factors were seeds, brokens passing through a 6/64 sieve, and contrasting classes. Average grade, U.S. Sample Mixed milled rice. Average total brokens, 72.6 percent.

Imported Rice

Source: Burma

(1) Medium grain (Japan, 25 percent brokens). Samples were high in seeds, heat-damaged kernels, brokens passing through a 6/64 sieve, and had some insects. Average grade, U.S. Sample grade Calrose. Average broken content, 35 percent.

Source: Spain

(1) Short (20 percent brokens). Samples had over 15 percent moisture and some insects. Average grade, U.S. Sample grade Pearl. Average broken content, 20 percent.

Source: North Viet-Nam

(1) Medium grain (40 percent brokens). Samples were high in total seeds and had some insects. Average grade, U.S. Sample Calrose. Average broken content, 38.1 percent.

Source: Communist China

(1) Medium grain (grade unknown). Samples had high seed and heat-damaged-kernels content and brokens passing through a 6/64 sieve. Average grade, U.S. Sample grade Nato. Average broken content, 34 percent.

(2) Medium grain (grade unknown). Samples had high seed content, total damaged kernels, and brokens passing through a 6/64 sieve. Average grade, U.S. Sample grade Magnolia. Average broken content, 40.9 percent.

(3) Medium grain (35 percent brokens). Limiting factors were brokens passing through a 6/64 sieve and contrasting classes. Average grade, U.S. Sample grade Mixed milled rice (Nato and Magnolia). Average broken content, 32 percent.

(4) Medium grain (grade unknown). Samples were high in seeds and red rice, and had some insects and foreign material. Average grade, U.S. Sample Calrose. Average broken content, 23.6 percent.

Source: Thailand

(1) Thailand long grain (grade unknown). Samples were extremely high in brokens passing through a 6/64 sieve, and had some contrasting classes. Average grade, U.S. Sample grade Blue Bonnet. Average broken content, 59 percent.

(2) Thailand long grain (grade unknown). Samples were high in red rice, extremely high in small brokens, with insects present. Average grade, U.S. Sample Brewers.

(3) Thailand medium grain (grade unknown). Samples were high in seeds, red rice, small brokens, with insects present. Average grade, U.S. Sample grade Magnolia. Average broken content, 58.6 percent.

(4) Thailand medium grain (50 percent brokens). Samples were high in contrasting classes, seeds, and brokens passing through a 6/64 sieve; insects were present. Average grade, U.S. Sample grade Mixed milled rice (Toro and Magnolia). Average broken content, 41.3 percent.

Source: Italy

(1) Medium grain (20 - 25 percent brokens). Samples were high in brokens passing through a 6/64 sieve, fairly high in contrasting classes. Average grade, U.S. Sample grade Nato. Average broken content, 44 percent.

Source: Brazil

(1) Short grain (grade unknown). In these samples, insects were present. Average grade, U.S. Sample Pearl. Average broken content, 12.2 percent.

(2) Medium grain (grade unknown). Insects were present in these samples. Average grade, U.S. Sample grade Blue Rose. Average broken content, 13.3 percent.

Source: Egypt

(1) Short grain (Mansouh - 20 percent). Samples were very high in seeds, and had considerable foreign matter. Average grade, U.S. Sample grade Pearl. Average broken content, 20 percent.

(2) Short grain (grade unknown). Samples were very high in seeds and heat-damaged kernels and had contrasting classes and considerable foreign material. Average grade, U.S. Sample grade Mixed milled rice. Average broken content, 17 percent.

(3) Short grain (grade unknown). Samples were high in seeds and heat-damaged kernels and had over 15 percent moisture. Average grade, U.S. #6 Pearl. Average broken content, 15 percent.

(4) Medium grain (grade unknown). Samples were high in seeds and heat-damaged kernels and had over 15 percent moisture. Average grade, U.S. Sample grade Nato. Average broken content, 21.1 percent.

Japan

Samples were taken in both 1958 and 1959 of domestic rice grown in the Prefectures of Miyagi, Chiba, Niigata, Akita, Toyama, Hyogo, Hiroshima, Kawaga, and Kumamoto. A system of grading standards is enforced under the Agricultural Production Inspection Law. All legal sales of rice by producers are made to the government under lot inspection. Domestic rice is classified into three categories--paddy, brown, and milled rice. Paddy has eight separate subcategories, brown rice has five, and milled rice, two. Imported rice, all being purchased by or for the government, is subject to inspection according to the shape of the grain, the degree of milling, and whether glutionous or nonglutinous in type.

The domestic rice samples in Japan were entirely of the Pearl type and found to be of excellent quality, with practically no insect infestation. The percentage of the total broken content was unusually low. The samples as a whole were clearly indicative of the major elements which make up the Japanese consumer preferences. Except for rice originating in Taiwan, the samples of imported rice taken were, in the main, of a lower quality grade; they had a higher percentage of brokens, often consisted of mixed classes, and contained considerable amounts of long and medium grain types not as highly preferred as the short grain. As an importing country that produces more than it buys, Japan is the one country where the quality grade of imports is materially lower than the average grade of the domestic rices.

Domestic Production (Milled)

(1) Norin 1 (#1 grade). Samples taken in 1959 and 1958 were of excellent quality. Average broken content 1.5 to 1.6 percent. General appearance of the samples was the limiting factor. Average grade, U.S. #2 and #3 Pearl.

(2) Norin #22 (#1 grade). Samples were of excellent quality, with almost complete lack of seeds and damaged kernels. Total brokens, 0.8 to 4 percent. General appearance was the limiting factor. Average grade, U.S. #2 and #3 Pearl.

(3) Norin 41 (#1 grade). Limiting factor was general appearance. Samples rated U.S. #3 Pearl. Average broken content, 5 percent. A few samples were graded as Sample because of moisture above 15 percent.

(4) Koshiji-Wase (#1 grade). Samples over the 2-year period were uniform. Limiting factor in about half the samples was the general appearance and in the balance heat-damaged kernels. Average grade, U.S. #3 Pearl, with 0.7 percent brokens.

(5) Sasashigure (#1 grade). The series of samples taken over the 2-year period showed exceptional consistency. The average grade was U.S. # 3 Pearl, with 1.5 to 3.5 broken kernels. A few exceptions were rated Sample Grade because of a moisture content over 15 percent.

(6) Norin 29 (#1 grade). Average grades were U.S. #2 to #3 Pearl, with the average broken content ranging from 0.5 to 3.7.

(7) Kinmaze (#1 grade). This series of samples taken in 1958 was the only example of insect infestation being a limiting factor. Samples were graded U.S. Sample grade Pearl for this reason. Average broken content was 5. Lacking the presence of insects the grade would have been approximately a U.S. #3 Pearl.

(8) Kinnmapu (#1 grade). This series taken in 1959 had an average of a U.S. #3 Pearl. The total broken content was 7.9 percent, which prevented classification as a grade #2.

(9) Norin 18 (#1 grade). Samples taken in 1959 graded a U.S. # 2 Pearl, while those taken in 1958 averaged a #3.

(10) Mihonishiki (#1 grade). Samples for both 1958 and 1959 were remarkably consistent, averaging in both series U.S. #3 Pearl.

Imported Rice

Source: Communist China

(1) Jojuko (grade unknown). Samples taken in 1958 on the average grade U.S. #4 Calrose, with 9.4 percent brokens.

Source: Egypt

(1) Variety unknown (grade unknown). Samples were generally high in moisture resulting in an average grade of U.S. Sample grade Pearl, with 6.4 percent brokens.

Source: Italy

(1) Variety unknown (grade unknown). Average grade was U.S. #3 Pearl, with 11.6 percent brokens.

Source: Spain

(1) Variety unknown (grade unknown). Samples taken in both 1959 and 1958 were high in moisture, resulting in a U.S. Sample Pearl grade. Brokens ranged from 12 to 12.3 percent.

Source: Thailand

(1) White Rice (Japan 5 percent broken grade). Samples showed relatively high seed count and percentage of contrasting classes; insects were present. Average grade, U.S. Sample Mixed milled rice, with 12 percent brokens.

(2) White Rice (Japan 10 percent broken grade). Samples showed high seed count, percentage of red rice, and contrasting classes; insects were present. Average grade, U.S. Sample grade Mixed milled rice, with 16 percent brokens.

Source: Burma

(1) Ngasein (Japan 15 percent brokens grade). Samples over 1959 and 1958 series were rated U.S. #3 - U.S. #5 Calrose. The exceptions were a series of samples taken in 1959 which, because of an average of 22.5 percent in contrasting classes, was rated U.S. #4 Mixed milled rice.

Source: Taiwan

(1) Bon Lai (grade unknown). Samples drawn in 1958 and 1959 ranged from U.S. Sample grade Pearl because of insects to a U.S. #5 Pearl, with the general appearance of the sample being the single limiting factor.

Philippines

There are 9 distinct varieties of long grain rice, 27 medium grain, and 2 short grain produced in the Philippines. Much of the rice is composed of a rather wide range of contrasting classes. The local practice of cooking rice in combination with other foods probably has contributed to this situation. Broken content is rather high, and little if any of the rice observed in the markets would grade better than a U.S. Sample grade. As is usually the case where the percentage of contrasting classes is high, the samples were generally high in seed counts. The percentage of small brokens (i.e., brokens passing through a 6/64 sieve) was high due to inadequate milling processes as well as to varieties and mixtures of varieties which have a marked tendency to shatter.

(1) Wag Wag (grade "1st quality"). Samples had a high count on total seeds and percentage of brokens passing through a 6/64 sieve. Graded as U.S. Sample grade Nato. Total brokens, 28 percent.

(2) Wag Wag (grade "2nd quality"). Samples had a high count on total seeds, brokens passing through a 6/64 sieve, and insects. Graded U.S. Sample grade Zenith. Total brokens, 41 percent.

(3) Elon-Elon (grade "1st quality"). Samples had a high total seed count and damaged kernels, brokens passing through a 6/64 sieve, and contrasting classes. Graded U.S. Sample grade Mixed milled rice. Total brokens, 37 percent.

(4) Elon-Elon (grade "2nd quality"). Samples averaged a high percentage of brokens passing through a 6/64 sieve and insects. Grade U.S. Sample Zenith. Total brokens, 37.1 percent.

(5) Macan (grade "2nd quality"). Samples had a high percentage of total seeds, brokens passing through a 6/64 sieve, and insects. Graded U.S. Sample Bazette. Total brokens, 30.1 percent.

(6) Macan (grade "1st quality"). Samples were high in total seeds, brokens passing through a 6/64 sieve, and insects. Graded U.S. Sample grade Bazette. Total brokens, 36.7 percent.

(7) Milagrosa (grade "2nd quality"). Samples were high in total seeds, brokens passing through a 6/64 sieve, and insects. Graded U.S. Sample grade Nato. Total brokens, 31.2 percent.

(8) Ramilad (grade "1st quality"). Samples were high in total seeds, brokens passing through a 6/64 sieve, and insects. Graded U.S. Sample grade Zenith. Total brokens, 40.8 percent.

(9) Minantica (grade "1st quality"). Samples were high in percentages of brokens passing through a 6/64 sieve; insects were present. Graded U.S. Sample grade Zenith. Total brokens, 38 percent.

(10) Bencer (grade "1st quality"). Samples were high in total seed count and percentages of brokens passing through a 6/64 sieve. Grade U.S. Sample grade Bazette. Total brokens, 35 percent.

(11) Consejala (grade "2nd quality"). Samples were high in total seeds and percentage of brokens passing through a 6/64 sieve; insects were present. Grade U.S. Sample grade Bazette. Total brokens, 39.5 percent.

EGYPT

Egyptian rice does not move into the domestic market on the basis of grade or of varieties. All rice harvested is mixed, and exports are on the basis of commercial grade, such as paddy, grades 1 and 2; cargo or brown rice, grades 1 and 2; and milled extra fancy and fancy, grades 1, 2, and 3. The specifications cover foreign grains, damaged or yellow kernels, paddy, red rice, shrunken or premature grains, green rice, moisture, and broken content.

A principal variety exported is Nahda (formerly known as Yabani Mont. 47), which was introduced about 8 years ago. It is somewhat of a medium-length kernel with a 150-day growing period. Other important varieties are Yabani Pearl and Yabani Mont. 7. These and other minor varieties are now being replaced by Calady U.S. #3, Giza 35, and Agami I.

(1) Nahda (grade unknown). Limiting factors are total seeds and heat-damaged kernels. Average grade, U.S. # 6 Pearl, with 2 percent total brokens.

(2) Agami (grade unknown). Average grade, U.S. Sample grade Pearl because of brokens passing through a 6/64 sieve and foreign material.

EUROPE

Italy

Samples of rice grown at Piemonte, Lomellina, Lombardia, and Emilia were taken in 1958 and 1959. There are four principal varieties grown for export--Originario, Americano 1600, Renaldo Bersani, and Arborio. These are marketed in three grades, Mercantile, Raffinato I°, and Raffinato II°. Americano 1600 was selected as a representative short grain rice, and samples were taken of each of the three grades. Two grades, Mercantile and Raffinato II°, were sampled for Arborio as a medium grain type and all three grades for a long grain, Renaldo Bersani. Generally, the principal limiting factors responsible for the assigned grade were the percentages of red rice and damaged kernels. Occasionally, heat-damaged kernels and the general appearance of the sample were limiting. Percentage of total brokens was consistently low through all varieties and grades. Samples were well milled, with insect infestation and foreign matter controlled.

(1) Americano 1600 (Mercantile). Samples were high in red rice, heat-damaged kernels, and damaged kernels. Average grade U.S. #5 Pearl. Average broken content, 1.9 percent.

(2) Americano 1600 (Raffinato 1° grade). Samples were high in red rice and damaged kernels. Average grade, U.S. #3 Pearl. Average broken content, 1.0 percent.

(3) Americano 1600 (Raffinato II° grade). Red rice and damaged kernels were the limiting factors. Average grade U.S. #3 Pearl. Average brokens, 1.1 percent.

(4) Renaldo Bersani (Raffinato 1° grade). Red rice and damaged kernels were the limiting factors. Average grade, U.S. #2 Honduras. Average broken content, 2.2 percent.

(5) Renaldo Bersani (Raffinato II° grade). Red rice and damaged kernels were limiting factors. Average grade, U.S. #3 Honduras. Average brokens, 2.0 percent.

(6) Renaldo Bersani (Mercantile grade). Average grade, U.S. # 4 Honduras on account of general appearance. Average broken content, 0.6 percent.

(7) Arborio (Raffinato II° grade). Average grade, U.S. #3 Blue Rose because of red rice and damaged kernels. Average brokens, 1.4 percent.

(8) Arborio (Mercantile grade). Average grade, U.S. # 5 Blue Rose because of general appearance. Average broken content, 1.4 percent.

Portugal

The rice industry in Portugal is located in five areas representing separate drainage basins for the Vouga, Mondego, Tagus, Sado, and the Guadiana Rivers. A range of varieties including long, medium, and short grain types are grown, with medium and short grain predominating. There are four separate commercial types that are, in effect, a series of grades:

Carolina type, which includes the varieties Bertons, Angola Crystal, Familia 181, and Rinaldo Bersoni. These are all long grains, although no variety is reported of commercial importance. They are marketed both as white rice and as glazed.

Gigante 1° (Giant No. 1), a medium grain group including the varieties Precoce, Nero Vialine, Razza 77, Stirp 136, and Allerio. Of these, Allerio and Precoce have the most importance commercially. These are marketed as white rice and as glazed.

Gigante 2° (Giant No. 2), which appears to be a short grain group including the varieties Marstelli, Ardizzone, Esphanol, Amarolo, Ponte Rubra, Balzzaretti, and Pierrot. Ponte Rubra is the most important commercially. These are sold as white rice or glazed.

Mercantile, the more important short grain group, with Chinese, Americano 1600, Precoce Vilorea. Chinese is the most important. Only white rice is marketed from this group. Corriente also appears at times as a distinct type but probably is the same as Mercantile, judging from a comparison of separate analyses.

On domestic markets there is a fifth group identified as "Current." This appears to be a cheap grade of a mixture of rices. Samples were taken in the Provinces of Ribalejo, Baixo Alentejo, and Alto Alentijo. The limiting factors resulting in the assigned grades were either total broken kernels or broken kernels passing through a 6/64 sieve. In general the milling was good and the control of insects and foreign material excellent.

(1) Local Gigante 1°. Average grade, U.S. #4 Blue Rose because of total brokens. Total brokens, 19.9 percent.

(2) Local Gigante 2°. Percentage of brokens was the limiting factor. Average grade, U.S. #5 Pearl. Total brokens, 27.4 percent.

(3) Local, Carolina. Average grade, U.S. # 3 Honduras because of the percentage of brokens. Total brokens, 12.9 percent.

(4) Local, Mercantile. Average grade, U.S. Sample grade Pearl, because of brokens passing through a 6/64 sieve. Total brokens, 30.3 percent.

(5) Local, Corriente. Average grade, U.S. Sample grade Pearl because of brokens passing through a 6/64 sieve. Total brokens, 34.2 percent.

Spain

The rice industry in Spain is largely centered in the vicinity of Valencia. Production is mainly of the small grain types, predominately Japonica. The crop is a transplanted one, and is handled with a considerable degree of mechanization, including artificial dryers. Mills are modern in type and specially adapted for processing small grain rice. There is an organized grading system in operation.

Samples were taken at Sevilla and Valencia in 1959 of three grades of the Belloch variety which, according to U.S. Standards, is classed as Pearl. The samples represented good quality milling quite comparable to that of the United States. Foreign material and insects were under good control. The limiting factor causing a specific U.S. grade was usually the number of broken kernels passing through a 6/64 sieve; these ranged from 0.3 to 0.7 percent for the entire range of samples, with an average of 0.47. Excess moisture was evident in the Japan #1 grade (Lonja de Valencia), but this evidently was a condition for one lot of material sampled rather than a major marketing problem.

(1) Belloch ("0" - 15 percent grade). Average grade U.S. #3 Pearl because of brokens through a 6/64 sieve. Total brokens, 11.1.

(2) Belloch ("1" - 15 percent grade). Average grade, U.S. #4 Pearl because of brokens through a 6/64 sieve. Total brokens, 13.2 percent.

(3) Belloch (Japan #1 grade). Grade, U.S. Sample grade Pearl because of moisture. Total brokens, 11.6 percent.

France

In France, rice production was not important until the mid-1940's. Acreages increased about 23 times in the 10-year period, 1945-1956. About 80 percent of the production is short grain varieties, with the remaining 20 percent being divided between medium and long grain types. Long grain production is not sufficient to meet consumer demand, but levels of price supports for lower yielding long grain types compared to short grain do not favor shifts to long grains. The limitation of the amounts of broken kernels that can be used in rice marketed as table rice also tends to hold production in short grain rice. Varieties of rice grown are largely of Italian origin. These are Balilla, Bellardone, Stirpe 82, Stirpe 136, Martelli, Rinaldo Bersani, and Americano 1600. Of these, Balilla, Bellardone, and Americano 1600 are short grain; Stirpe 82 and 136 and Martelli are medium grains; and Rinaldo Bersani is a long type.

The marketing of rice for human consumption is controlled by government standards. For rice known as "table rice," the broken content is limited to less than 5 percent, while for the "deluxe table rice" brokens are limited to less than 3 percent. Samples were taken in the Briches-du-Rhone area of both table rice and deluxe table rice in the varieties available.

(1) Balilla (table rice). Average grade, U.S. #3 Pearl because of general appearance, seeds, and heat-damaged kernels. Total brokens, 2.9 percent.

(2) Stirpe #82 (deluxe table rice). Average grade, U.S. #3 Fortuna because of general appearance. Total brokens, 1.8 percent.

(3) Rinaldo Bersani (deluxe table rice). Average grade, U.S. #3 Edith because of general appearance. Total brokens, 1.4 percent.

Greece

There are five separate rice producing areas in Greece--Lamia, Agrenion, Kalamata, Salonika, and Serres. Samples were drawn from each area. Only two varieties are grown: Short grain Americano 1600 and long grain Bersani. There is no grading system, so representative samples were taken of average qualities available in the markets. As expected, samples varied considerably. All samples of Americano were uniformly rated as Pearl. In the case of Bersani, 66 percent of all samples were rated Edith, about 10 percent Honduras, and 24 percent were rated as Mixed milled rice. In the latter case, the mixtures were rather uniformly rated as Edith and Pearl. In the short grain group, moisture percentages ran high, but generally the most consistent limiting factors were the general appearance of the rice and the number of broken kernels passing through a 6/64 sieve.

The Bersani variety rated about two numerical grades lower on the average than Americano 1600. About 20 percent of the samples graded a borderline #3 Edith, coated; 45 percent a #6 Edith, coated; and 35 percent Sample grade Edith, coated. The principal limiting factors in the group graded as Sample were red rice, damaged kernels, and general appearance. Milling for the two varietal groups was below standard, but insects and foreign material were well controlled. It was quite apparent that commercial market grades acceptable to the consumer had a relatively low percentage of brokens. Of all samples taken, the highest percentage recorded was 13.8 percent, while at the same time a considerable number of samples had broken contents considerably below the average shown. It would appear that, as far as consumer preference is indicated from rather broad sampling, imports of rice would move most readily for short and long grain varieties of a U.S. #3 or #4 grade with brokens limited to at least 10 percent.

(1) Americano 1600 (grade unknown). General appearance and percentage of brokens passing through a 6/64 sieve were limiting factors. Average grade, U.S. # 3 Pearl, coated. Total brokens, 10 percent.

(2) Bersani (grade unknown). Average grade, U.S. #5 Edith, coated. Total brokens, 7.9 percent.

West Germany

While West Germany produces no rice, it has long been the center of a well-developed and efficient rice milling industry. The volume handled today is only about one-quarter of that of prewar days but appears now to be growing. Following World War II, the entire milling industry had to be rebuilt. Up to the present time, about three-quarters of the total imports of rice have been of short grain varieties but the percentage is slowly shifting to long grains.

Most of the imports into West Germany are in the form of cargo or brown rice. Imports of rice in this form are duty free and this, together with a very efficient operation on the part of German millers, results in practically all rice going into West Germany being reprocessed to some degree. Samples were taken for the purpose of evaluating the milling standards which might be assumed to be a fair measure of German consumer preference and acceptance. While it has been possible to identify the source of the rice, this point has no significance since the rice in its imported form has been reprocessed and its identity lost.

Generally speaking, samples fell consistently in a range of from a No. 3 grade to a No. 5 (U.S. Official Standards). The percentage of total brokens was usually low, with only one sample grading 25 percent brokens or over. Short grain varieties appeared to have a slight quality edge, with a predominance of grade 3's. The sources of these varieties were Italy, Spain, and Egypt. Medium grain varieties generally averaged midway between a grade 4 and 5. These varieties were imported from Argentina, Hungary, Thailand, and Burma. The long grains coming from Thailand and Surinam ranged in grade between a 4 and a 5.

Rice milled from parboiled cargo Italian short grain rice was sampled in two grades. The resultant milled parboiled, while grading about like the average rice processed in Germany, rated only Sample parboiled under U.S. Official Standards. In all samples of parboiled rice checked, there was a high percentage of ungelatinized kernels, ranging from averages of 56 percent for Avorio Carolina to 77 percent for Avorio.

The West German milling industry can apparently mill short grain better than other classes. The consumer preference appears to be for a rice about equivalent to a U.S. #3 for short, long, and medium grain in the order named, noting, however, that the long grain volume appears to be the one that is growing. Over a number of years, it is likely that parboiled rice will gain in favor although the present product available as far as indicated by the samples taken is not of a quality which will expand the use of parboiled rice very rapidly.

Iran

About 80 percent of Iran's rice is produced in the Caspian area, although some is grown in all parts of the country. Samples were largely taken from northern Iran. There are about 20 varieties grown in the Caspian area. These are in long grain types--Domsiah, Rashti Domdar, Rashti Bidom, Ambarboo, Molai, Darbari, Sadri, and Monsai. Sadri is the most important variety. Medium grain varieties include Champa, Amoli, Sadri, Mazanderan, Shakok, Zardok, Taromi, and Benam. Champa is the most important. In short grains, the following varieties and grown: Shastak, Shakak, Gerd, Gerdeh, Mahamadi, and Razak. Gerdeh is the principal variety.

There is no adequate grading system. In the long grain group, the principal variety is usually sold as I, II, or II grade. (Samples were taken of I and II.) Other varieties in the group are not so separated. The medium and short grain groups appear not to have similar divisions in the case of Champa and Gerdeh. It is customary to blend different rices for individual local markets, so this affects the range of the samples taken.

The long grain varieties are consumed locally; medium and short grain types make up most of whatever is exported. From the series of samples taken, it is quite apparent that the long grain types have consumer preference and command a quality premium in the domestic market; medium or short grain types are of poor quality and offered at the lowest prices. While the data secured are not sufficient to evaluate the quality levels of exports in these two classes, it is quite possible that any exports from the area are of rice of below average quality.

Generally, the average of samples taken of long grain Sadri I rated U.S. Patna #3, and Sadri II rated U.S. Patna #4; the other long grain sampled, Dom Siah Rashti with no grade distinction, averaged U.S. Patna #3. The limiting factors were rather generally total seeds and general appearance. Samples taken of Champa, a medium grain type, all rated U.S. Magnolia Sample grade, with a very high total seed content and with broken kernels passing through a 6/64 sieve, foreign material, and a rancid odor being limiting factors. Samples of Guerdeh, a short grain type, similarly were all rated U.S. Pearl Sample grades because of total seeds, brokens passing through a 6/64 sieve, and foreign material.

The total broken content for the long grain variety was remarkably low, averaging less than 10 percent, although the milling was below standard. This probably resulted from the blending for individual local markets where the long grain commands a premium. On the question of consumer preference, any imports into Iran would fall quite apparently in the Patna classification.

(1) Sadri (#1 grade). Average grade, U.S. #3 Patna because of general appearance. Total brokens, 5.6 percent.

(2) Sadri (#2 grade). Average grade, U.S. #4 Patna because of seeds. Total brokens, 9.5 percent.

(3) Dom Siah Rashti (grade unknown). Average grade, U.S. #3 Patna because of general appearance. Total brokens, 3.0 percent.

(4) Guerdah (grade unknown). Average grade, U.S. Sample grade Pearl because of foreign material and brokens passing through a 6/64 sieve. Total brokens, 30 percent.

(5) Champa (grade unknown). Average grade, U.S. Sample Magnolia because of seeds and odor. Total brokens, 18.5 percent.

Turkey

Turkey normally consumes all of the rice it produces, and imports are generally of a higher quality than domestic rices. The production is predominately short grain, with the Akceltik variety representing the largest acreage. This is a native variety perhaps nearly 3 centuries old. It is used mainly in palav. The second largest plantings are in the variety Devris, also used in palav. Misir is used mostly in soup. One long grain variety, Berzani, is grown. Most of the varieties originated in Italy or Egypt.

It is difficult to obtain representative samples because most of the market supplies are mixed rice sold without any established grading system. The samples were taken in order to determine the general range of the supplies available for consumption from the domestic crop. The rice from which samples were drawn was produced in Maras, Adana, Antalya, Thrace, Kastomouni, and Sinop. The major part of the market supplies are Pearl type, with the long grain variety, Berzani, resembling Honduras.

The limiting factors were a high percentage of seeds, heat-damaged kernels, weevils, and foreign material. However, total brokens for all short grain varieities averaged considerably under 10 percent. The samples taken of the long grain variety, Berzani, rated higher on the average at approximately a U.S. #5, with total brokens extremely low. Seeds and heat-damaged kernels were generally the limiting factors.

While the major portion of existing market supplies is of short grain, it is quite likely that long grain types between a U.S. #3 and #5 would have good consumer response.

(1) Akceltik (grade unknown). Average grade, U.S. Sample grade Pearl because of seed count, insects, and foreign matter. Average broken content, 10.4 percent.

(2) Misir (grade unknown). Average grade, U.S. Sample grade Pearl because of seed count, insects, and foreign material. Average broken content, 10.2 percent.

(3) Devris (grade unknown). Average grade U.S. Sample grade Pearl because of seeds and insects. Average broken content, 6.2 percent.

(4) Bersani (grade unknown). Average grade, U.S. #5 Honduras because of seeds and heat-damaged kernels. Average broken content, 7.1 percent.

(5) Violin (grade unknown). Average grade, U.S. Sample Pearl because of high moisture content. Average broken content, 3.8 percent.

SOUTH AMERICA

Argentina

The commercial culture of rice in Argentina is of fairly recent origin, dating back to about 1935. Two general types of rice are grown--short and medium grain, with American varieties used in part. There are no existing grading standards; export sales are conducted largely on the basis of samples or agreed specifications. Most of the exports from Argentina, particularly to the European market, are of the Blue Rose variety or varieties resembling it. It is doubtful whether any of the local varieties ever leave the domestic market. Production of medium grain types, both from imported and local seed, amounts to 70-75 percent, while short grain varieties account for the rest. The samples were drawn from the six northwestern Provinces.

(1) Blue Rose (packaged rice). Limiting factors were red rice and damaged kernels. Average grade, U.S. #4 Blue Rose, coated. Average broken content, 3.9 percent.

(2) Chacarero (packaged rice). While the samples could only be rated "reasonably well milled," the only limiting factor was general appearance. Average grade, U.S. #3 Zenith. Average broken content, 6.5 percent.

(3) Chacarero (grade unknown). Limiting factors were seeds, heat-damaged kernels, and total brokens. Average grade, U.S. #4 Zenith. Average broken content, 20.5 percent.

(4) Local variety (packaged rice). Samples were well milled, slightly gray in color; general appearance was the main limiting factor. The average grade was U.S. #2 Pearl, coated. Average broken content, 4.7 percent.

(5) Local variety (grade unknown). Samples had moisture over 15 percent, and were very high in seeds, high in red rice, damaged kernels, insects. Average grade, U.S. Sample grade Pearl, coated. Average broken content, 23.7 percent.

Brazil

Most of the rice exported from Brazil is produced in the Rio Grande do Sul area where the production is largely mechanized. While rice can be and is produced in many areas of Brazil, currently the principal producing States are Rio Grande do Sul, São Paulo, Minas Gerais, Maranhao, and Mato Grosso.

A grading system is in effect which provides for the tagging and stenciling of the export bags to indicate the seller and the date of packaging or shipment. By a series of stencil colors the quality or grade is also indicated. Generally, there are three categories of quality in somewhat common usage in the domestic market. These are #1 good quality, #2 regular or fair quality, and #3 industrial rice.

Three types of rice are grown--long, medium, and short grain. The export trade is primarily in long grain but includes some medium types. Probably the short grain types are ordinarily consumed locally.

(1) Meio (grade unknown). Samples had high seed and heat damage count, percentage of red rice, and brokens passing through a 6/64 sieve; insects were generally present, and color was dark gray. Average grade, U.S. Sample grade Magnolia. Average broken content, 25 percent.

(2) Bica Corrida (grade unknown). Samples had high seed and heat-damage count, high percentage of red rice and damaged kernels, and brokens passing through a 6/64 sieve; insects were present, and color was dark gray. Average grade, U.S. Sample grade Magnolia. Average broken content, 40.9 percent.

(3) Chumbinho (grade superior). Samples were reasonably well milled, had some damaged kernels and red rice; insects were present. Average grade, U.S. Sample grade Pearl. Average broken content, 14.6 percent.

(4) Agulha (special grade). Samples were reasonably well milled; insects and rodent excreta were present. Average grade, U.S. Sample grade Edith. Average broken content, 14.1 percent.

(5) Agulha (grade unknown). Samples showed high count on seeds and heat-damaged kernels; insects were present. Average grade, U.S. Sample grade Century Patna. Average broken content, 13.5 percent.

(6) Collete (grade unknown). Seeds, red rice, damaged kernels, and contrasting classes were fairly high; insects were present. Average grade, U.S. Sample grade Prelude. Average broken content, 41 percent.

(7) Primeira (grade unknown). Samples were extremely high in seeds, high in red rice and damaged kernels, fairly high in contrasting classes; insects were present as were traces of foreign material. Average grade, U.S. Sample grade Prelude. Average broken content, 15.5 percent.

(8) Sequeiro (grade extra). Samples were well milled although slightly gray in color. Red rice and damaged kernels were the limiting factors. Average grade, U.S. #4 Edith, coated. Average broken content, 1.2 percent.

(9) Sequeiro (grade special). Samples were consistently reasonably well milled of a light gray color. Red rice and damaged kernels were the limiting factors. Average grade, U.S. #5 Edith, coated. Average broken content, 11.8 percent.

(10) Sequeiro (grade superior). Red rice and damaged kernels were limiting factors. Average grade, U.S. #6 Edith, coated. Average broken content, 24 percent.

(11) Calora (grade special). Samples had a fair amount of seeds, were well milled but with insects present. Average grade, U.S. Sample grade Pearl. Average broken content, 3.6 percent.

(12) Local variety (grade unknown). Samples were well milled although somewhat high in red rice and damaged kernels. Average grade, U.S. #4 Blue Rose. Average broken content, 14.4 percent.

(13) Local variety (grade special). Samples were high in seeds, red rice, and damaged kernels; insects were present. Average grade, U.S. Sample grade Zenith. Average broken content, 9.1 percent.

(14) Local variety (grade unknown). Samples were very high in heat-damaged kernels and had traces of foreign material. Average grade, U.S. Sample grade Century Patna. Average broken content, 21.3 percent.

(15) Local variety (grade unknown). Samples had some red rice and damaged kernels; insects were present. Average grade, U.S. Sample grade Early Prolific. Average broken content, 19.0 percent.

Ecuador

Samples were drawn from the coastal region of Ecuador where the rice production of the country is located. There are a large number of varieties grown on small farms in plots of down to 5 acres. For this reason, mechanization is not common. The production is largely divided into four fairly distinct groups: (1) Early-maturing 90-day rice, such as Canilla Chato which resembles the variety NIRA; (2) Canilla largo, which has a growth period of about 150 days, the grain of which resembles the variety Prelude; (3) Fortuna, which is preferred rice for local consumption; and (4) rice from imported seed, Nira Blue Bonnet, Sunbonnet, Rexora, Century Patna, Patna, and Rexark.

There are no official grading standards. The quality of rice sold is left to the discretion of the miller. In general, exports are confined to rice with 2-3 percent yellow grain, damaged or stained kernels, 0.1 percent rough rice, and reasonably well milled.

(1) Canilla Chato (grade unknown). Samples were high in seed count, very high in heat-damaged kernels, low in total brokens (6.6 percent), had some contrasting classes, and insects generally present. The average grade was U.S. Sample grade Nira.

(2) Canilla Largo (grade unknown). Samples were very high in heat-damaged kernels. Average grade, U.S. # 6 Prelude. Average total broken content, 13 percent.

(3) Fortuna (grade unknown). Samples were exceptionally high in seeds, had some insects, and contrasting classes were 26.2 percent. Average grade, U.S. Sample grade Mixed milled rice Fortuna and Zenith. Broken content, 10.9 percent.

(4) Nira (grade unknown). Samples were high in seed count, heat-damaged kernels, brokens passing a 6/64 sieve, contrasting classes. Insects were generally present. Average grade, U.S. Sample Mixed milled rice (Edith and Magnolia).

(5) Rexora (grade unknown). Samples were extremely high in heat-damaged kernels and high in seeds. Average grade, U.S. Sample grade Rexora.

(6) Magnolia (grade unknown). Samples had heat-damaged kernels and brokens passing through a 6/64 sieve. Average grade, U.S. Sample Magnolia.

Colombia

Samples were taken at Palmira, Buga, Jamundi, Valle, Meta, and Acacias. Larger amounts of American seed rice have been imported in the past decade, so that a mixture of U.S. long and medium grain varieties are in use together with old native strains. The samples as a whole indicate that the limiting quality factors of Colombia's rice are the larger amounts of seeds, heat-damaged kernels, red rice, and damaged kernels consistently present in the majority of all samples taken.

(1) Fortuna (#2 grade). Samples were extremely high in heat-damaged kernels. Average grade, U.S. Sample grade Prelude.

(2) Lucerna (grade unknown). Samples were high in red rice and damaged kernels. Average grade, U.S. #6 Calrose.

(3) Rojo (grade corriente). Samples were extremely high in seeds and total damaged kernels. Average grade, U.S. Sample Nato. Average total broken content, 55.6 percent.

(4) Rojo (grade unknown). Samples were extremely high in seeds, red rice, damaged kernels, and brokens passing a 6/64 sieve. Average grade, U.S. Sample Nato. Average total broken content, 45.7 percent.

(5) #203 (#1 grade). Samples had a high percentage of red rice and damaged kernels. Average grade, U.S. Sample Nato. Average broken content, 30.6 percent.

(6) #203 (#2 grade). Samples were high in red rice, seeds, and damaged kernels; insects were present. Average grade, U.S. Sample Nato. Average broken content, 42.7 percent.

(7) Mon-olayo (#1 grade). Samples were high in seeds, heat-damaged kernels, red rice, and total damaged kernels. Average grade, U.S. Sample Prelude. Average broken content, 15.4 percent.

(8) Mono-olayo (#2 grade). Samples were high in seeds, heat-damaged kernels, red rice, and damaged kernels. Insects present. Average grade, U.S. Sample Prelude. Average broken content, 11.3 percent.

(9) Blue Bonnet (#1 grade). Limiting factors were some seeds, larger amount of heat-damaged kernels. Average grade, U.S. #5 Blue Bonnet. Average broken content, 7.2 percent.

(10) Blue Bonnet (#2 grade). Limiting factors were large numbers of seeds, red rice, and damaged kernels; insects were present. Average grade, U.S. Sample Blue Bonnet. Average broken content, 26.3 percent.

(11) Blue Bonnet (popular grade). Average grade, U.S. Sample Screenings.

El Salvador

Only a limited number of samples were taken in El Salvador because of the non-availability of the market development funds being used for the project. Samples taken of local rice indicated about an equal division between the Fortuna and Blue Bonnet types. All samples taken were graded as Sample grades either because of extremely high counts of heat-damaged kernels or the percentage of brokens passing through a 6/64 sieve. Insects were generally present. Two market grades were noted: Standard and Mixta. There was no apparent quality differentiation between them. The only consistent factor found in addition to insect infestation was that the average broken content was about 30 percent for all samples taken.

Guatemala

A limited number of samples was taken from rice grown in the northeast and the southeast sections of Guatemala. When rice is offered for sale in local markets it bears no varietal name. It is called "arroz de primera clase or arroz quebrado." The customer takes his choice, but this is apparently based on his observations of the lots offered for sale rather than on any distinct demarcation between the two listed classifications. Ordinarily the percentage of brokens is high, and there is an appreciable amount of foreign material present. Much of the rice grown today in Guatemala originally came from Fortuna seed around 1940. There has been so much crossing and mixing that now a high percentage of all rice grown is known as "Criollo."

Mexico

Samples were taken of rice produced in the States of Vera Cruz, Morelos, Puebla, and Sinoloa. Several series of samples were taken of Mexican Blue Bonnet grown from seed originally imported from the United States. In the examination for quality factors under U.S. Official Rice Standards, all samples of this type were graded Blue Bonnet. In the case of locally named varieties sampled, the predominant class occurring was Edith, followed by Fortuna and Magnolia, in the order named.

(1) Morado Criollo (grade unknown). Samples were gray in color, with seeds and heat damage evident. Average grade, U.S. #6 Edith. Average broken content, 5.3 percent.

(2) Morado Criollo (mixture) and Colima. Seeds and heat-damaged kernels were limiting factors. Average grade, U.S. Sample grade Mixed milled Rice (Edith and Magnolia). Average broken content, 13.1 percent.

(3) Colima and Jujutla (mixture). Red rice and damaged kernels were limiting factors. Average grade, U.S. #5 Edith. Average broken content, 11.7 percent.

(4) Jujutla (mixture). Limiting factors were seeds, heat-damaged kernels, and insects. The samples were well milled. Average grade, U.S. Sample grade Edith. Average broken content, 2.4 percent.

(5) Jujutla (mixture). Limiting factors were red rice and damaged kernels. Average grade, U.S. #5 Edith. Average broken content, 11.7 percent.

(6) Jujutla (super-extra grade). Samples were white in color and well milled but the grade level was reduced by seeds. Average grade, U.S. #3 Fortuna. Average broken content, 6.4 percent.

(7) Meco de Jujutla (grade unknown). Samples were relatively high in damaged kernels. Average grade, U.S. #4 Edith. A few samples rated as Sample grade because of rodent excreta and damaged kernels. Some samples were an apparent mixture of Edith and Magnolia classes.

(8) Blue Bonnet #50 (grade unknown). Seeds, damaged kernels, and insects were limiting factors. Samples were well milled, creamy color. Average grade, U.S. Sample Blue Bonnet. Average broken content, 29 percent.

(9) Blue Bonnet #50 (5 percent brokens). Limiting factors were seeds and insects. Average grade, U.S. Sample grade Blue Bonnet. Average broken content, 6 percent.

(10) Blue Bonnet #50 (25 percent brokens). Samples were high in seeds. Average grade, U.S. #5 Blue Bonnet. Average broken content, 14.7 percent.

(11) Blue Bonnet #50 (50 percent brokens). Samples were high in seeds and many samples evidenced rodent excreta. Average grade, U.S. Sample grade Blue Bonnet. Average broken content, 41 percent.

Peru

Peru produces only about 10 distinct varieties of rice, of which only 6 are of major importance. The known grades are "Extra" and "Common", depending upon the relationship of whole grains to either split or broken grains. The general specifications for the "Common" grade is "grains of approximately 5 mm. in length with not more than 20-25 percent of split grains, 2 percent spotted grains, and 14 percent moisture".

All rice sold is distributed by the government, and milling operations are similarly controlled. It is estimated that, of the total rice marketed, 97.5 percent is graded as the "Common", or "corriente", grade and not more than 2.5 percent is of the "Extra" grade. Samples were drawn from Chic Payo, Lima, and Arequipa.

(1) Local variety (extra grade). Average grades ranged from a U.S. Sample grade Mixed rice (Edith and Zenith or Edith and Nato) to a Sample grade Edith. The limiting factors were seeds, heat-damaged kernels, and insects.

(2) Local variety (corriente grade). All were sample grades as was the "Extra" grade and for generally the same factors. The average broken content was 31 percent. The two grades therefore vary only in total broken content, and both consistently have the same other limiting factors.

Chile

Samples were taken from rice produced in Talca, Linares, Colchagua, and Parral. There are now only two grades of rice marketed in Chile for the local production: Super Extra and Common, or "Corriente." These vary considerably in the market, but with the main factor being the percentage of brokens. These vary in the Super Extra from 8.2 to as high as 45.0 in the Corriente. The poor qualities are likely to have relatively high amounts of seeds and red rice.

Venezuela and Costa Rica

Although no samples were taken in these two countries, the following information is included in order to round out the Latin American rice picture.

In Venezuela the following varieties are being grown: Fortuna, Rexora, Blue Bonnet, Zenith, Century Patna, Carolina, Sianero, Secano Morado, Secano Blanco, Garrapato, Manoleyo and Camilla.

In Costa Rica the following varieties are being grown: Rexora, Blue Bonnet, Nira, Magnolia, Century Patna, Carolina and Berlin. Rexora apparently has the preference.

UNITED STATES DEPARTMENT OF AGRICULTURE
1862 1962
Growth Through Agricultural Progress

☆ U.S. GOVERNMENT PRINTING OFFICE : 1961 O - 586831